THE PLANT DISEASE REPORTER

Issued By

THE PLANT DISEASE SURVEY

Division of Mycology and Disease Survey

BUREAU OF PLANT INDUSTRY, SOILS, AND AGRICULTURAL ENGINEERING

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The Plant Disease Reporter is issued as a service to plant pathologists throughout the United States. It contains reports, summaries, observations, and comments submitted voluntarily by qualified observers. These reports often are in the form of suggestions, queries, and opinions, frequently purely tentative, offered for consideration or discussion rather than as matters of established fact. In accepting and publishing this material the Division of Mycology and Disease Survey serves merely as an informational clearing house. It does not assume responsibility for the subject matter.

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THE PLANT DISEASE SURVEY
DIVISION OF MYCOLOGY AND DISEASE SURVEY

Plant Industry Station — Beltsville, Maryland
Volume 35 — October 15, 1951 — Number 16

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FORECASTING POTATO LATE BLIGHT IN CONNECTICUT [1]

Russell Hyre [2] and James G. Horsfall [3, 4]

Introduction

To predict the weather is a hazardous business. To predict a disease, influenced by the weather, would seem to border the impossible. In fact, though, this is not so. Stevens and Haenseler (5) have done very well with predicting outbreaks of bacterial wilt of sweet corn and Cook (2), and later Nugent (4), has reported success with late blight of potato and tomato.

The reason for this apparent paradox, of course, is that the onset of disease lags behind the significant weather by a matter of days or even longer. In turn, this lag is due (a) to the need for an incubation period and (b) to the need for several generations of spores to build the inoculum potential up to an epiphytotic level.

Late blight (Phytophthora infestans) of potato is a good disease for studying the problem of prediction. It is a popular plant disease.

Cook (2) concluded that late blight in eastern Virginia and in the Charleston, South Carolina area could be predicted from an analysis of rainfall and temperature. Wallin and Waggoner (6) found these meteorological factors alone were ineffective in Iowa. Such a divergence of opinion always is stimulating to scientists. The problem can be resurveyed with new data or experimental forecasts can be made. Both approaches are under way. This paper reports a study of additional historical data.

G. P. Clinton, long-time Botanist of the Connecticut Agricultural Experiment Station, maintained an interest in late blight and recorded its occurrence annually from 1902 to 1937, inclusive. Among other things he was the first to culture the fungus artificially and the first to discover the oospores.

We deemed it worthwhile to collect Clinton's data and attempt to correlate it with rainfall and temperature using Cook's (2) approach and Wallin and Waggoner's (6) statistics.

Historical data are always somewhat tantalizingly incomplete. We wish that Clinton had used numerical figures for severity. We wish that he had always recorded date of first occurrence, had always mapped the State in terms of severity in each year. We wish that building lots had not encroached on the potato fields of southern Connecticut or that potatoes had not shifted from early varieties along the shore to late varieties inland with the passage of time. We do not know whether Clinton rated his severity in terms of sprayed or unsprayed vines.

Still the observations were made in a small State by one man over a long period of time. Hence, they have been useful to make an ad hoc study of late blight in relation to some aspects of the weather. Data from 1937 to date were provided by various people in the Department of Plant Pathology and Botany of the Station.

We translated as well as possible Clinton's verbal descriptions of severity into five categories of none, trace, light, moderate, and severe. For purposes of calculation, these data were then lumped into, none, little (trace and light), and much (moderate and severe) blight groups. Since we could not be sure of the geography of Clinton's statements, we had to use averages of weather data for New Haven and Hartford, two stations about 35 miles apart, one in each of the two large potato areas of the State.

Occurrence of Potato Late Blight in Connecticut from 1902 through 1950

Clinton's records and subsequent records of the Connecticut Agricultural Experiment Station showed that during the past 49 years no blight occurred in 11 years (1908, 1909, 1911, 1912, 1913, 1921, 1923, 1924, 1929, 1943, and 1944); much occurred in 13 years (1902, 1903, 1910, 1915, 1919, 1920, 1928, 1938, 1942, 1945, 1946, 1947, and 1950); and little was present in the remaining 25 years. Unfortunately, however, the date of first occurrence of blight was not recorded for

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[1]Report of a study conducted under the Research and Marketing Act of 1946. This investigation was conducted cooperatively between the Connecticut Agricultural Experiment Station and the Division of Mycology and Disease Survey, Bureau of Plant Industry, Soils and Agricultural Engineering, United States Department of Agriculture.

[2]Pathologist, Division of Mycology and Disease Survey, U. S. Department of Agriculture.

[3]Plant Pathologist, Connecticut Agricultural Experiment Station, New Haven, Connecticut.

[4]The writers wish to thank Dr. Paul E. Waggoner, now of the Connecticut Agricultural Experiment Station, for valuable suggestions.

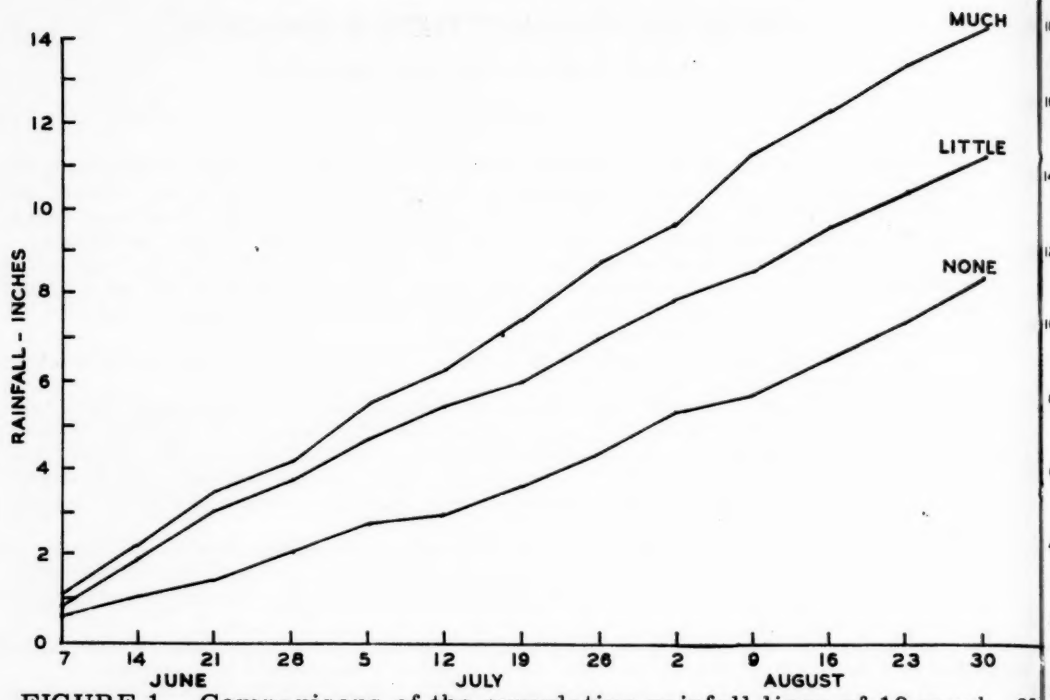


FIGURE 1. Comparisons of the cumulative rainfall lines of 13 much, 25 little, and 11 none blight years for Hartford and New Haven, Connecticut for the period 1902-1950.

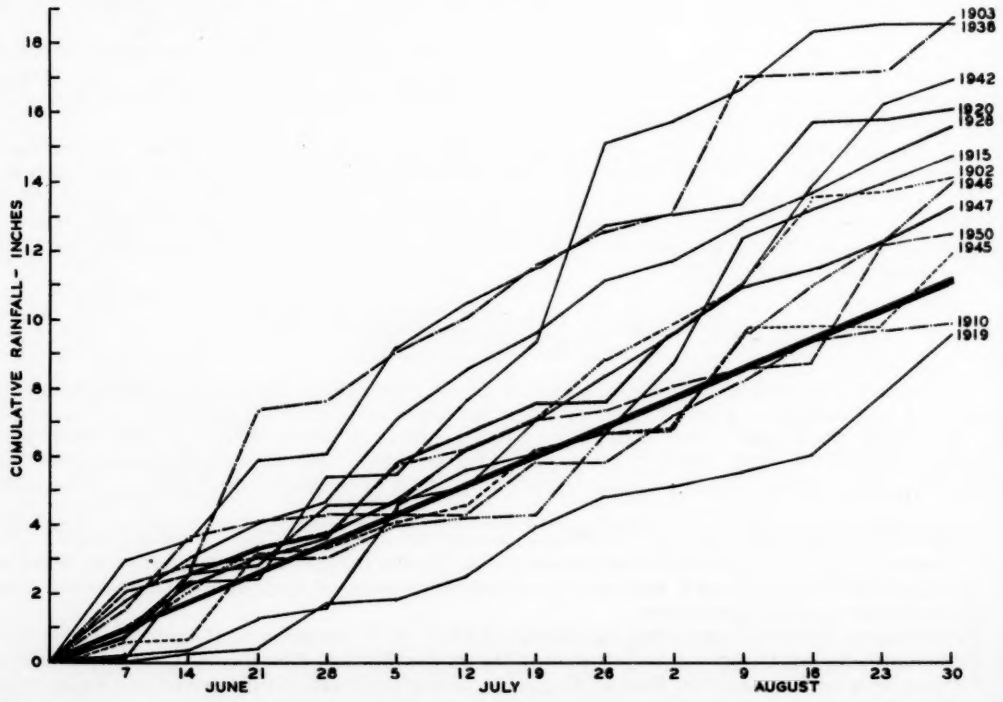


FIGURE 2. The relation of 13 much-blight years to the critical rainfall line

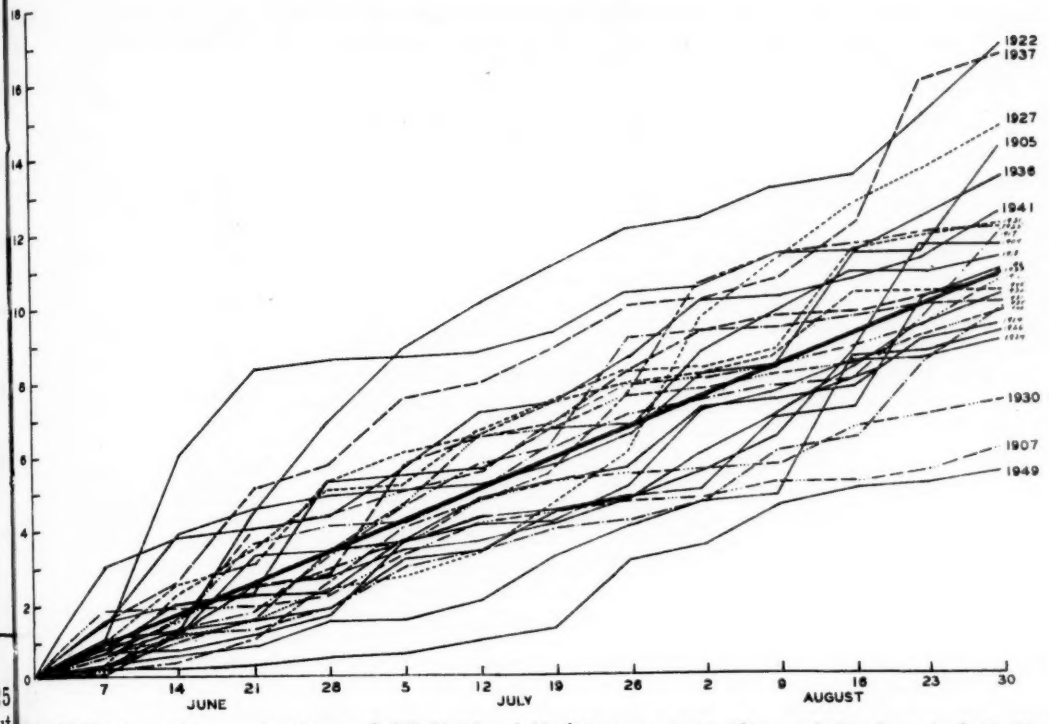
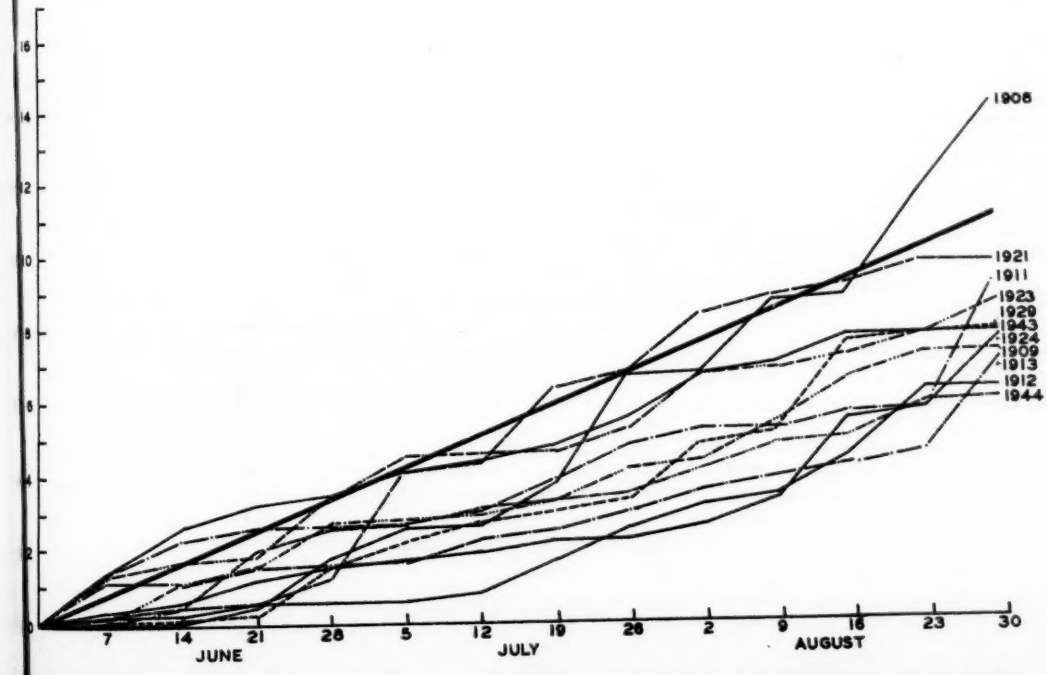


FIGURE 3. The relation of 25 little-blight years to the critical rainfall line.



URE 4. The relation of 11 none-blight years to the critical rainfall line.

the years 1910, 1915, 1930, 1931, 1932, 1933, 1937, 1938, 1939, 1940, 1942, 1945, and 1947. The date of first occurrence would have aided considerably in correlating rainfall and temperature immediately preceding with outbreak of the disease.

Rainfall and Temperature Data for Hartford and New Haven, Connecticut

Rainfall and temperature data for Hartford and New Haven were compiled from the climatological data of the United States Weather Bureau. The weekly averages of rainfall and temperatures were obtained for the two stations for the 13 weeks from June 1 to August 30, inclusive. June 1 was selected as the starting date because late blight has not been reported in the field in Connecticut before June 23. Thus there is a 23-day period from the time records start until late blight was first reported in Connecticut. Cook (2) allowed a similar period before first reported late blight occurrence in Virginia. In general, potatoes are about six inches tall on June 1.

The forecast period was terminated August 30 because in the past the growing season of potatoes has been nearly over by that date. With the advent of DDT, however, the forecast period may need to be extended.

Relation of Rainfall to Late Blight

In accordance with Cook's method, the weekly mean cumulative rainfall in inches was determined for the thirteen much blight years, the twenty-five little blight years and the eleven no blight years. The weekly mean cumulative rainfall for the three groups of blight years are shown in Figure 1. In no case do the curves overlap each other. The data are clear cut, the more the rain, the more the blight. Stated in other words, the steeper the slope of the cumulative rainfall line the worse the disease.

Perhaps the most interesting aspect of Figure 1 is that the cumulative rainfall for little blight is 2.93 inches more than that for no blight. An additional 2.96 inches of rain, however, increased the disease to much. Certainly the difference in the effect on the plants was much more than would be indicated by the additional rainfall. The available data are probably too crude to investigate this thoroughly, but this probably is another case that "nature counts in logarithms". Horsfall and Barratt (3) have shown that one estimates disease in logarithms. If so, then the data in Figure 1 can probably be stated as follows. The logarithm of potato blight varies with cumulative rainfall -- or as the amount of cumulative rainfall increases late blight increases logarithmically.

A critical rainfall line was determined by obtaining the slope of a curve midway between the much blight and no blight curves. Then, cumulative rainfall lines for individual years of the three blight groups were plotted against this critical line as shown in Figures 2, 3, and 4.

Generally, for the much blight years, the individual year lines fall above the critical line. The line for the year 1919 is a notable exception.

For the little blight years the individual year lines fall both above and below the critical line. A few years vary considerably from the critical line.

For the non-blight years the individual year lines all fall below the critical line except the lines for four years which fall above the critical line for part of the time only.

Thus the much blight and no blight years are pretty well separated by the critical line.

Straight lines were fitted to the cumulative rainfall data for the individual years by the method of least squares. The calculated slopes of the cumulative rainfall lines were grouped on the basis of blight severity as described above and are presented in Table 1. The data were examined by analysis of variance and accompanying "t" test.

The mean slope of each blight group is significantly different, at the 1% level, from each other mean (Table 2).

An average of the cumulative rainfall slope means for the much blight years and the no blight years is 0.8370. Comparisons of this critical line slope with the calculated slopes shown in Table 1 indicate that about 85 percent of the much blight years had slopes greater than the critical slope. A similar comparison indicates that about 91 percent of the no blight years had slopes less than the critical slope. Of the little blight years, 56 percent of the slopes were greater and 44 percent were less than the critical slope.

Table 1. Slopes of 49 least square lines through cumulative rainfall points for the thirteen week period beginning June 1 at Hartford and New Haven.

Blight Development							
Year	Much	Year	Little	Year	Little	Year	None
1902	1.1072	1904	.7785	1931	.9933	1908	.8517
1903	1.5393	1905	.9943	1932	.7210	1909	.5501
1910	.8072	1906	.9421	1933	.7255	1911	.5697
1915	1.0507	1907	.5234	1934	.7256	1912	.3774
1919	.5884	1914	.7309	1935	.8858	1913	.4112
1920	1.4129	1916	.8669	1936	1.1896	1921	.7994
1928	1.2662	1917	.8381	1937	1.2445	1923	.6792
1938	1.5508	1918	.9371	1939	.6327	1924	.4241
1942	1.1800	1922	1.3691	1940	.8211	1929	.5495
1945	.8569	1925	.9760	1941	1.0306	1943	.6864
1946	.9286	1926	.6089	1948	.9290	1944	.4661
1947	1.0242	1927	1.0155	1949	.3844		
1950	.9276	1930	.6301				
Mean	1.0954				0.8598		0.5786

Table 2. Comparison of blight group means.

Blight Group	LSD 5% Level	LSD 1% Level	Difference in mean slope
Much vs. Little	0.159	0.213	0.2356**
Little vs. None	0.169	0.226	0.2812**
Much vs. None	0.191	0.256	0.5168**

** Difference is significant at 1% level.

Weekly Mean Temperature and Blight Years

The weekly mean temperatures of the blight year groups were calculated and plotted in Figure 5. All weekly mean temperatures were below the critical temperature of 75° F. The

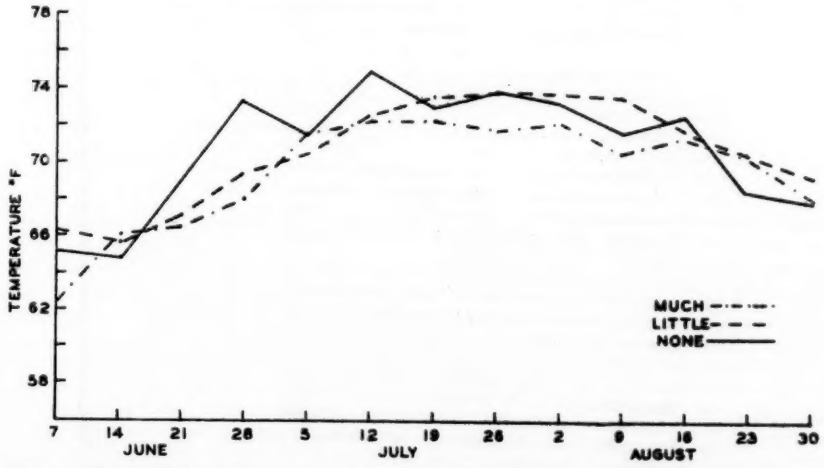


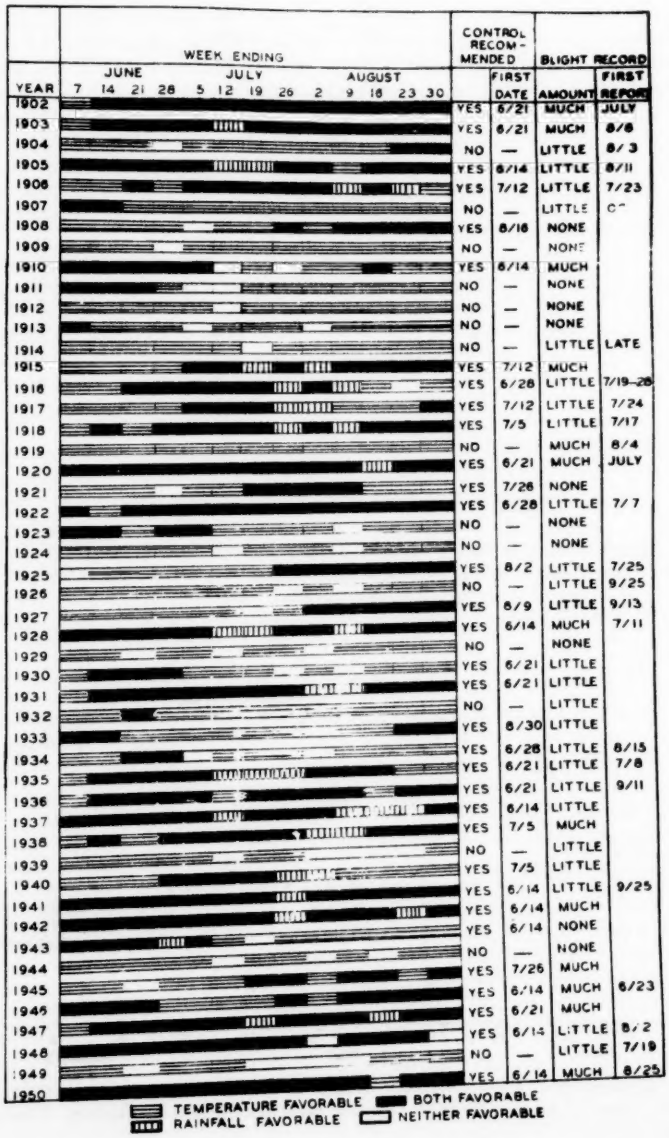
FIGURE 5. Comparison of the weekly means of daily maximum-minimum temperatures of 13 much, 25 little, and 11 none blight years for Hartford and New Haven, Connecticut, for the period 1902-1950.

highest mean temperature was 74.9° F. The weekly mean temperatures for the no blight and little blight years generally were a little higher (Maximum of 5.4° F.) than were those of the much blight years but this was not always true. For forecasting purposes, however, weekly mean temperatures and rainfall of individual years must be considered.

The Relationship of Weekly Periods of Temperature and of Cumulative Rainfall to Late Blight

The rainfall and temperature data for the period 1902 through 1950 were analyzed by weekly periods and summarized in Table 3 along with the late blight record. The rainfall was considered

Table 3. The relation of temperature and rainfall to the severity of late blight in Connecticut for the period 1902-1950.


WEEK ENDING
JUNE
JULY
AUGUST
7 14 21 28 5 12 19 26 2 9 16 23 30
CONTROL RECOM-MENDED
BLIGHT RECORD
YEAR
FIRST DATE
AMOUNT
FIRST REPORT
1902 YES 6/21 MUCH JULY
1903 YES 6/21 MUCH 8/8
1904 NO — LITTLE 8/3
1905 YES 6/14 LITTLE 8/11
1906 YES 7/12 LITTLE 7/23
1907 NO — LITTLE
1908 YES 8/16 NONE
1909 NO — NONE
1910 YES 6/14 MUCH
1911 NO — NONE
1912 NO — NONE
1913 NO — NONE
1914 NO — LITTLE LATE
1915 YES 7/12 MUCH
1916 YES 6/28 LITTLE 7/19-28
1917 YES 7/12 LITTLE 7/24
1918 YES 7/5 LITTLE 7/17
1919 NO — MUCH 8/4
1920 YES 6/21 MUCH JULY
1921 YES 7/26 NONE
1922 YES 6/28 LITTLE 7/7
1923 NO — NONE
1924 NO — NONE
1925 YES 8/2 LITTLE 7/25
1926 NO — LITTLE 9/25
1927 YES 8/9 LITTLE 9/13
1928 YES 6/14 MUCH 7/11
1929 NO — NONE
1930 YES 6/21 LITTLE
1931 YES 6/21 LITTLE
1932 NO — LITTLE
1933 YES 8/30 LITTLE
1934 YES 6/28 LITTLE 8/15
1935 YES 6/21 LITTLE 7/8
1936 YES 6/21 LITTLE 9/11
1937 YES 6/14 LITTLE
1938 YES 7/5 MUCH
1939 NO — LITTLE
1940 YES 7/5 LITTLE
1941 YES 6/14 LITTLE 9/25
1942 YES 6/14 MUCH
1943 NO — NONE
1944 YES 7/26 MUCH
1945 YES 6/14 MUCH 6/23
1946 YES 6/21 MUCH
1947 YES 6/14 LITTLE 8/2
1948 NO — LITTLE 7/19
1949 YES 6/14 MUCH 8/25
1950
TEMPERATURE FAVORABLE
RAINFALL FAVORABLE
BOTH FAVORABLE
NEITHER FAVORABLE

favorable for late blight if the cumulative amount equalled or exceeded that for the critical line constructed midway between the cumulative rainfall lines for the much blight and no blight years. Temperature was considered favorable if the weekly average was 75° F. or less. Control measures are indicated after two consecutive weeks of favorable rainfall and temperature (2), and the probable weather forecast for the succeeding week would have been for continued favorable blight conditions. The date control measures would first be recommended and the date late blight was first observed (when available) are given.

The forecasts of blight would have been correct in 78 percent of the years -- in 38 of the 49 years. (Actually the forecasts would have been correct more than 78 percent of the years since blight did not occur until many weeks after the forecast period in several years when no blight was forecast.) In three (1908, 1921, 1943) of the remaining 11 years, the forecast would have been for late blight and none occurred. In seven additional years (1904, 1907, 1914, 1926. 1932, 1939, 1949) the forecast would have been for no blight and a little (trace in 5 years, light in 2) occurred. This leaves one year (1919) when the forecast would have been for no blight and much occurred. Thus for the 49-year period the forecast would have been incorrect for late blight, to the extent of "much," in only two percent of the years.

Results of verification are briefly summarized in the following form:

		Forecast	
		no	yes
Blight Occurrence	no	8	3
	yes	8 (trace 5; light 2; severe 1)	30

In 8 years fungicide applications would have been withheld at a saving to the producer. In 3 years fungicides would have been applied, during part of the season only, unnecessarily. In 8 years fungicides would not have been recommended yet blight occurred - trace or light during 7 years and severe in one year. In 30 years fungicides would have been applied to control blight that otherwise would have occurred. Thus if forecasting had been in use since 1902, spraying for late blight might have been curtailed or eliminated, during the forecasting period at least, in 16 percent of the years. In many of the other years some of the late blight sprays might have been eliminated. In some years more spraying, or better timing of sprays, and better control of blight probably would have resulted.

DISCUSSION

The data presented above indicate that it is possible to predict the probable occurrence of late blight on potato foliage in Connecticut with about 80 percent accuracy by means of a critical cumulative rainfall line and weekly mean temperatures. During the 49-year period considered in this study the occurrence of foliage blight to the extent of "much" occurred in only two percent of the years when the forecast would have been for no blight. Thus the method would seem to have real merit for the area indicated in saving the cost of late blight sprays when they are not needed and of assuring their application in time when they are needed.

The method investigated here is not the complete answer to the problem though. Consider the year 1919 for instance. The cumulative rainfall line was well below the critical line throughout the 13-week period ending August 30 and on that date was about 1 1/2 inches below the critical line. Although the temperature was favorable for blight throughout the period the forecast would have been for no blight, yet blight was severe. According to the Experiment Station card file late blight was first found on August 4, little damage occurred until about August 18, then the vines were rapidly blighted by August 31. Almost four inches of rain fell

during the last two weeks of August. The month was described as "wet and foggy." The nearly four inches of rainfall did not bring the cumulative rainfall line up to the critical line due to the great deficiency before the middle of August.

It would appear that changes in the slope of the cumulative rainfall line might be a more accurate criterion of the probable occurrence of late blight than the position of the line. If the slope was greater than that of the critical line for several successive weeks, the subsequent occurrence of blight might be indicated even though the cumulative line continues to lie below the critical line. Thus frequency of occurrence of conditions favorable for the increase of P. infestans probably would be a more reliable criterion for forecasting blight.

During some years, 1919 and 1936 for instance, the moving chart described by Cook (2) might have been more reliable for predicting blight than the cumulative rainfall line. Even more detailed records of relative humidity, such as those of Wallin and Waggoner (6) would surely have been valuable.

With the advent of DDT the forecasting period probably should be extended to September 13 or later. Even without DDT in four years the first record of blight was in September and in two of these years it was on September 25. In one year it was first recorded in October.

On the other hand, in only one year was the first record of potato late blight in the field in June -- it was recorded on June 23 in 1946. However, in 1948 it was found on June 14 in a cull pile.

It must be emphasized again that forecasting of late blight on potato, according to the method outlined, would be on an area basis. Individual farms or fields may have some blight even though it is absent in the area generally. Local knowledge would need to be applied in such cases. In using the method, where there is doubt, control measures should be recommended even though later found not to be necessary rather than err in the other direction.

The data presented above show that prediction of late blight in Connecticut follows essentially the same pattern as that found in eastern Virginia and eastern South Carolina (Cook, 2). It is a different pattern from that of Iowa (6). Cook's pattern works along the Atlantic Seaboard, not inland. Why?

The success of Cook's method depends upon the occurrence of reasonably uniform primary inoculum potential from year to year. This tends to be the case along the seaboard, not inland. Seaboard farmers obtain their potato seed from late blight areas further north along the seaboard. The seed provides a reasonably uniform inoculum. Iowa obtains its potato seed from a reasonably blight free area farther north. The inoculum is not uniform from year to year. Blight probably follows the same inherent weather pattern in Iowa as in Connecticut, but the inoculum is governed by an outside source. If the seed distributes no inoculum, blight will be absent irrespective of the weather. All of this leads on to the point that late blight in the seed crop of the previous year must be considered in making predictions. It may well be that blight was absent in Maine in the years that preceded the years when blight was absent in Connecticut although the weather was favorable. Conversely, blight may have been heavy in the seed crop for the years when blight appeared even though the weather was somewhat unfavorable.

The results of this study relate to the occurrence of late blight on potato only. The pattern of late blight on tomato in Connecticut is quite different from that on potato.

SUMMARY

Rainfall and temperature data from Hartford and New Haven, Connecticut, were analyzed in relation to occurrence of late blight on potato foliage in Connecticut for the period 1902 through 1950.

Forecasts based on this analysis would have been correct 78 percent of the time in the 49-year period. In another six percent of the years forecasts would have been for blight and none occurred. This leaves 16 percent of the years when forecasts would have been for no blight but blight occurred. In seven of the eight years in this 16 percent trace (5 years) or light (2 years) blight was observed. This leaves one year in 49 that blight was severe when the forecasts would have been for no blight.

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DIVISION OF MYCOLOGY AND DISEASE SURVEY, NEWARK, DELAWARE, AND THE CONNECTICUT AGRICULTURAL EXPERIMENT STATION, NEW HAVEN

A NEW SEVERE CASE OF POTATO WART IN PENNSYLVANIA

Russell Hyre

On August 20, 1951, the writer participated in the digging of a small garden of potatoes near Freeland, Pennsylvania, that had over 95 percent wart. It was obviously early severe stoloniferous infection since very few tubers even started to form. Rank top growth on the manured fertile soil gave no indication of the wart present underground.

There were several unique features about this case. (1) This was the most complete destruction by wart ever observed by Dr. Hartman in all his work with this disease. Prior to this year he had not been able to approach closely this amount of infection the first season after planting tubers in soil known to be heavily infested. Indications are, though, that cooler average soil temperatures this summer favored early infection with a corresponding increase in the ultimate amount of disease. (2) This garden was under State inspection the last three years when susceptible Russet Rural potatoes were grown and no wart was found. (3) This garden was in a new section that was developed from brush and woodland some 15 years ago. Thus the organism had arrived at this garden site presumably from some nearby infected garden since the control program was first put in effect in 1932.

Dr. Hartman is now studying temperature-pathogenicity relationships of the organism taken from this garden at the long-established potato wart laboratory of the Pennsylvania Department of Agriculture near Hazelton, located in the wart-infested region. It is his opinion that this probably is a severe outbreak of an old infection that did not show up the last few years possibly because of soil temperatures. If so, it emphasizes the importance of continued alertness for this disesae even after it is thought to be completely eradicated. There can be no doubt of the potential sudden and complete destruction of the crop if the organism is present and susceptible varieties are grown. This fact is illustrated in Figure 1.

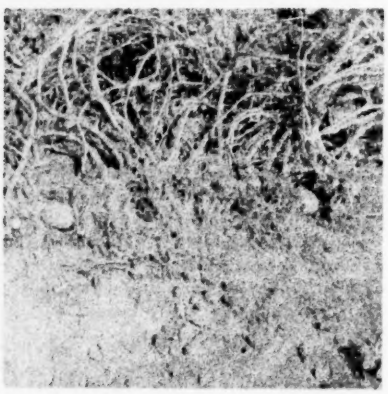

FIGURE 1. A severe case of potato wart. Only two sound tubers were found in the first eight hills dug. Many wart masses are present. Even fewer sound tubers were found in other parts of the garden.

DIVISION OF MYCOLOGY AND DISEASE SURVEY, CROP PLANT DISEASE FORECASTING PROJECT, NEWARK, DELAWARE

POTATO WART IN MARYLAND

R. A. Jehle

One warted potato of the susceptible variety Marygold was found on August 28, 1951, in a garden at Klondike, Allegany County, Maryland. Potato wart caused by Synchytrium endobioticum (Schilb.) Perc. was first observed in this garden in 1921. It was quarantined at that time along with other gardens in which wart had been found, and the immune variety Irish Cobbler was planted from 1922 to 1946 inclusive under the supervision of the State Plant Pathologist. From 1947 to 1951 inclusive susceptible varieties were planted to determine whether the wart organism had been eradicated from the soil. All of the potatoes grown in this garden were examined every year and this is the only warted tuber which has been found. Plans are being made to treat all infested gardens by the chemical means described by Hartman (PDR 35(6): 268-271).

DEPARTMENT OF PLANT PATHOLOGY, UNIVERSITY OF MARYLAND

APPLE SCAB RESISTANCE SURVEY OF SOUTH DAKOTA APPLE VARIETIES AND BREEDING STOCKS

S. A. McCrory and J. R. Shay

Unusually frequent rains and cool temperatures in Eastern South Dakota during the spring and early summer of 1951 favored the development of an unprecedented epiphytotic of apple scab. An opportunity was provided for field evaluation of scab resistance of hundreds of hybrid seedlings, varieties and foreign introductions of the Department of Horticulture of the South Dakota Agricultural Experiment Station. The late Professor N. E. Hansen began a program of apple improvement in 1904 with the aim of combining quality of fruit and cold hardiness. He made extensive crosses of common varieties with the native crabs and with Russian varieties and species (primarily Malus baccata) collected during six plant exploration trips to Russia. Three varieties released by South Dakota have been found by the junior author to be highly resistant to apple scab in greenhouse and field tests in Indiana. These are: Alexis and Dolgo (seedlings of M. baccata cerasifera) and Jonsib Crab (Johnathan x Irkutsk (M. baccata)). With this evidence of scab resistance in M. baccata it seemed highly probable that other varieties derived from this species might prove resistant.

The plantings at Brookings and Watertown were examined in mid-July. Varieties such as McIntosh, Mantet, Virginia Crab and Hibernal were practically defoliated by scab. Infection was quite uniform in the various plantings whether clean cultivated or in sod.

A special effort was made to examine all varieties described by Professor Hansen in his three summary bulletins (1, 2, 3). Varieties listed in these publications which were not available for examination are: Adno, Ann Trio, Ben Trio, Bismer, Cal Trio, Caputa, Chinook, Dan Trio, Elta, Fay Trio, Guy Trio, Hans Trio, Hibkee, Irkutsk, Ivan, Joe Trio, Kazan, Kit Trio, Nocalyx, Sapinia, S. D. Macata, S. D. Wendel, Sereda, Wahoya, Wakaga, Wakonda, Wanblee, Watopa, Waubay, Wiyuta, Wotanda, Zaga, Zeleba and Zita.

Described varieties (1, 2, 3) which were found to be infected with apple scab are as follows: Alexis, Amsib, Amur, Anoka, Beauty, Caramel, Chance, Dolgo, Erl Trio, Forest King, Giant, Goldo, Good, Hopa, Izo, Keo, Lemon, Lina, Linda, Maga, Mercer, Missouri, Nebo, Nevis, New Duchess, Olga, Oxbo, Redflesh, Sasha, S. D. Ben, S. D. Bona, S. D. Eda, S. D. Waldo, Selma, Shoko, Sugar, Tolmo, Volga, Wakapala, Wamdesa, Waziya, Wecota, Wetonka, Yellow Sweet and Zelma.

Described varieties (1, 2, 3) found to be free from apple scab infections are: Cathay (M. prunifolia var. rinkii), Elk River (M. ioensis), Kola (Elk River x Duchess), Red Tip (Elk River x M. pumila var. niedzwetzkyana), S. D. Jonsib (Johnathan x M. baccata), Tipi (Elk River x Duchess) and Zapta (Elk River x Bismark).

More recent South Dakota releases which were found to be infected with scab are: Almata, Ata, Eda, Kasha, Kensib, Max Trio, Semla, S. D. Golden and S. D. Winter.

Several Russian varieties were available for examination. Only one, Antonovka monasir, was found to be free from scab. Varieties exhibiting scab infections are: Anisim, Antonovka Polterarer, Arkad Zentnin, Bellefleur Kitaika, Bellefleur Kranal, Bellefleur Kitaika, Bessenianka, Kitik Cherenkoe, Ketyr Shafran, Kitai Kut, Kitoika Zololoi, Komsomolez, Komsomoletsch, Kuloi Kitanka, Michurian #1, Michurian #334, Omsk, Paradiska Mitchurian, Red Bellefleur, Red Soviet, Wisantowoye and Yakhontowoye.

Two seedling apple blocks of about ten acres each representing crosses made by Professor Hansen were available for examination. One is located at Watertown and the other at Brookings. Original planting distance was 5 feet x 20 feet, but many weak or otherwise undesirable seedlings have been removed so that only about 40 percent of the original trees remain at Watertown and about 20 percent at Brookings. Only six seedlings were found to be free from scab:

Cross No.	Parentage
T1641	Cathay Crab seedling, o.p. (three seedlings)
T3103	Nevis x Dolgo
T3145	Unknown x Hopa
T3255	Antonovka monasir, o.p.

Scions from these seedlings were collected for propagation and further testing.

Some 1300 seedlings of M. baccata established from seed collected in Russia by Professor N. E. Hansen and his son, Carl, in 1924 and 1927 were examined at the Hansen Nursery at

Brookings. Scab infection was very heavy in this closely planted block of old trees. All but six of the seedlings were found to be infected. Scions for propagating and further test were collected from five of these scab-free trees.

DISCUSSION

The susceptibility of Dolgo and Alexis in this field test is of considerable interest since these varieties have exhibited only necrosis without sporulation in greenhouse infection tests in Indiana using Illinois, Indiana, and Wisconsin isolates of the fungus and have remained scab-free in Indiana in the field since 1948. Propagating scions of Dolgo and Alexis used in the Indiana tests were obtained from the University of Minnesota Fruit Breeding Farm, Excelsior, Minnesota. Seedling progenies of Dolgo x Wealthy in the field at Excelsior showed segregation for resistance in 1947. Certain of these resistant segregates propagated and tested in the greenhouse and the field in Indiana since 1948 have proven as resistant as the Dolgo parent. It would appear that either (1) a different race of Venturia inaequalis capable of attacking Dolgo and Alexis is present in South Dakota or (2) the varieties Dolgo and Alexis as maintained in South Dakota are different from the trees bearing the same names maintained in Minnesota. Plant and pathogen material are being propagated for comparative studies aimed toward an explanation of this situation.

The freedom from scab of Elk River, a selection of M. ioensis, and certain of its hybrids, is of interest. These varieties and Cathay are being propagated for further tests.

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SOUTH DAKOTA AGRICULTURAL EXPERIMENT STATION, BROOKINGS, AND PURDUE UNIVERSITY AGRICULTURAL EXPERIMENT STATION, LAFAYETTE, INDIANA

A BLOSSOM END ROT OF APPLES IN NEW YORK CAUSED BY BOTRYTIS[1]

D. H. Palmiter

A blossom end rot of Rome Beauty apples was seen in the Hudson Valley in 1946 and found to be caused by Botrytis cinerea. Since then similar infections have been noticed on other varieties including McIntosh and Cortland. However, in no previous year has the occurrence of blossom end rot been so general throughout the Hudson Valley or so abundant as in 1951. Early July counts of infected fruits in experimental plots and in commercial McIntosh orchards showed a range from less than one percent to as high as six percent diseased fruits on some trees. Unsprayed trees in a given area showed similar amounts of infection as trees that received a regular sulfur spray program. This is taken as clear evidence that it did not start as arsenical injury with which it has been commonly confused.

On May 11 and 12, 1951 a 28 to 34 hour rain or wet period occurred with temperatures between 46 and 48 degrees F. (Figure 1). This came at the end of McIntosh bloom and apparently Botrytis infection of sepals occurred at this time. Those fruits which were in an upright position at this time and thus collected water in the calyx end of the fruit were most subject to infection. As the apple tissue below the sepals became infected the area turned brown and was often surrounded by a red margin which made the infected fruits quite conspicuous by the end of June (Figure 2).

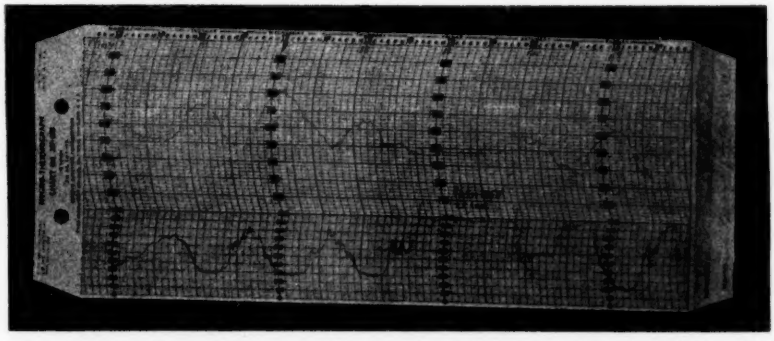

FIGURE 1. Hygrothermograph record of 28 hour wet period at New Paltz, at temperatures of 46° to 48° F. on May 11 to 12 that resulted in blossom end rot of apples in 1951.

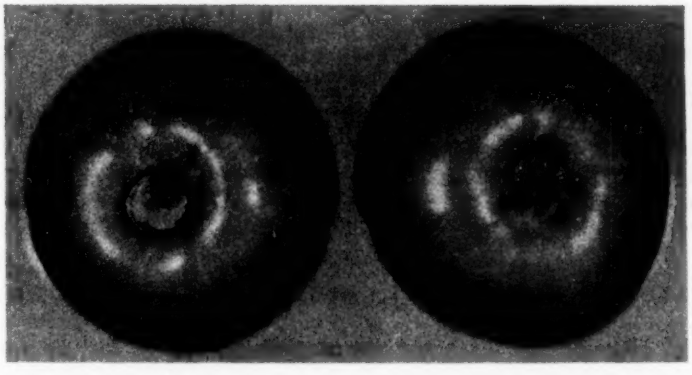

FIGURE 2. McIntosh apples showing blossom end rot in July as a result of sepal infection by Botrytis cinerea in May.

[1]Journal Paper No. 871, August 17, 1951, approved by the Director of the New York State Agricultural Experiment Station, Geneva, New York.

Table 1. Effectiveness of various fungicides for the control of blossom end rot of McIntosh apples.

Orchard location	Percentage of apples infected					
	Sulfur 8-100	Fermate 1 1/2-100	Mercury 1/2 or 1-100	Crag 341 1 1/2 qts.-100	Phygon 1/2-100	Orthocide 406 2-100
Poughkeepsie [a]	4.7	0.1	0.1	0.5	0.5	0
New Paltz [b]	5.0	0.4	2.4	3.0	4.0	-
Rock City [c]	2.5	0.4	2.0	-	-	0.3

[a] Poughkeepsie plots were sprayed with Sulfur, Fermate, Crag 341 and Orthocide 406 on May 10 before the rain started. The Mercury plots (Puratized 1 pt.-100 and Dynacide 1/2 lb.-100) and the Phygon plots were sprayed on May 12 after the rain stopped.

[b] New Paltz plots were sprayed May 9 and May 14. Tag 331 was used at 1/2 pt.-100.

[c] Rock City plots were sprayed May 8 and 18. These trees were in full bloom on May 11 and 12.

Records obtained in experimental plots used for testing fungicides for apple scab control indicated that sulfur fungicides had very little if any effect on reducing blossom end rot on McIntosh apples in 1951. But trees in the same orchards that had been sprayed with Fermate 1 1/2-100 showed much less infection than sulfur sprayed trees (Table 1).

Protective fungicides such as Crag 341 used at 1 1/2 qts. in 100 gallons of spray and Orthocide 406 used at 2-100 also afforded good control of Botrytis rot when applied just before the rain period (Poughkeepsie plots) but Crag 341 at 1 1/2 qts.-100 failed to give much protection when applied two days before the rain and three days following the rain as happened at New Paltz (Table 1). Sulfur dust applied during the rain did not prevent infection. Phygon 1/2 lb.-100, Puratized Agricultural Spray 1 pt.-100 and Dynacide 1/2 lb.-100 applied on May 12, at the end of the rain (Poughkeepsie plots) resulted in good control but when Phygon 1/2 lb.-100 or Tag 331 1/2 pt.-100 was applied on May 9 and 14 (New Paltz) control was poor. The plots at Rock City were sprayed on May 8 and 18 and the trees were in full bloom during the rain of May 11 and 12. Under these conditions Fermate 1 1/2 lbs.-100 and Orthocide 406 2 lbs.-100 gave better control than Micronized sulfur 8-100. The fact that Fermate offered good control in all three orchards indicates that it is more toxic to Botrytis cinerea than the other materials. This has been pointed out before. Palmiter and Hamilton[2] reported that Fermate was better than sulfur for Botrytis rot on sweet cherries and Emerson[3] reported Fermate more effective than bordeaux mixture for the control of Botrytis rot of currants.

Unless blossom end rot of apples becomes more prevalent than it has been in the past there is probably little need for any change in the apple spray schedules or materials for its control. In past seasons only an occasional infected fruit has been found and even in 1951 the average loss would amount to less than three percent of the apples even where it was most serious. However, should there be any need for a fungicide to control Botrytis on apples the ferbam fungicides show the most promise since they give protection under adverse conditions and are already in common use in the Hudson Valley for the control of cedar apple rust, quince rust, and apple scab.

NEW YORK STATE AGRICULTURAL EXPERIMENT STATION, GENEVA

[2] Palmiter, D. H. and J. M. Hamilton. Organic materials in pre-harvest sprays for cherries. Phytopath. 33: 683-690. 1943.

[3] Emerson, Frank H. Diseases of currants in New York and their control. Farm Research 16: 15. Oct. 1950.

LABRELLA CORYLI (DESM. & RAB.) SACC. ON FILBERTS IN NORTH AMERICA

Paul L. Lentz

On August 3, 1951, Dr. H. L. Crane of the Division of Fruit and Nut Crops and Diseases sent a specimen of diseased filbert leaves to the Division of Mycology and Disease Survey for study. The bushes from which these leaves had been obtained were part of an experimental planting of F_1 hybrids obtained by crossing plants of Corylus americana Walt. with C. avellana L. They were suffering a severe defoliation at about the time the nuts were filling. It seemed that this could be detrimental to the production of a satisfactory crop and also ultimately result in the loss of the bushes. Of the two varieties concerned, Reed and Potomac, the former was approximately four times more severely affected than the latter.

A characteristic diseased leaf (Figure 1) showed a marginal browning, particularly in the vicinity of its tip, but gradually involving more of the margin and usually spreading inward toward the midrib. The lesions were not uniform in shape and lacked conspicuous margins, except that the transitions from dead brown to living green areas were abrupt. The dead margin of an affected leaf had a tendency to roll inward over the upper surface. In later stages a considerable portion of the leaf was brittle and dead, and it finally dropped from the bush. The ground beneath the more severely affected plants was littered with dead leaves.

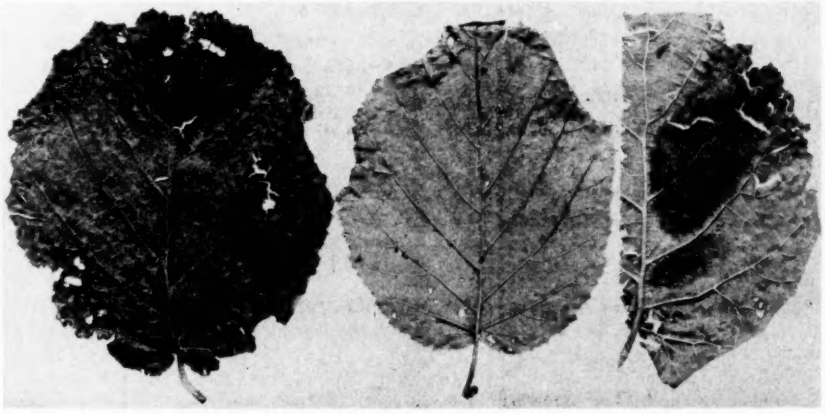

FIGURE 1. Lesions caused by Labrella coryli (Desm. & Rab.) Sacc. on leaves of Corylus hybrid. From left to right are shown the upper surface of a leaf with a large dead area at the tip, the lower surface of a leaf with several young marginal lesions, and the lower surface of a leaf on which the necrotic area has spread inward toward the midrib and is covered by secondary fungi. Photographed by R. L. Taylor, Division of Plant Exploration and Introduction. Reduced to 6/10 actual size.

Examination of the larger lesions revealed mostly secondary fungi such as Alternaria. On the younger lesions the only fungi in evidence were numerous black or dark-brown bodies about 60-95 microns in diameter. These were mostly on the lower surface of the leaf, but some were also found on the upper surface. They were usually plentiful on the dead areas of the leaf, but were not so closely grouped as to be confluent. These fruiting bodies had a circular outline in surface view. When examined in vertical section they were found to originate from a flattened stromatic base beneath the leaf cuticle and were flattened-convex. These fructifications measured approximately 25-30 microns from base to apex. They were covered by a grayish membrane which, in most sections, seemed to be the leaf cuticle or at least to be contiguous with it. In a few sections this covering could be interpreted as a structure produced by the fungus. The membrane had an irregular raised network on its outer surface, the raised lines being about 1 micron high and 1-1.5 microns broad. The lines were somewhat discontinuous and in places consisted of discrete protuberances linearly arranged. The rectangular to hexagonal areas formed by this network were approximately 3-4 microns in diameter. Simple conidiophores originated from the flattened stromatic pad at the base of the fruiting body. These bore conidia which were hyaline, oblong with rounded ends, 12.5-15.5 x 5.5-6 microns and filled with a number

of minute refractive globules.

This fungus, apparently the cause of the brown lesions on the leaves, was determined as Labrella coryli (Desm. & Rab.) Sacc. (syn. Cheilaria coryli Desm. & Rab.), belonging in the family Leptostromataceae of the Fungi Imperfecti. In Saccardo (Sylloge Fungorum 3: 648. 1884.) the lesions caused by this fungus are described as cinerescent, amphigenous, and irregular, the perithecia pallid-brown, subgregarious, and usually hypophyllous, with the spores hyaline, oblong, and 12-15 x 5 microns. Examination of a specimen of Briosi and Cavara's number 23 (I Funghi Parassiti Delle Piante Coltivate Od Utili. 1888.) labelled Labrella coryli Sacc. revealed that it was identical with the Beltsville collection, except that its fruiting bodies were mostly not so dark. This difference appears to be without significance.

Labrella coryli seems never previously to have been reported from North America. It has been found throughout Europe (including France, Italy, Belgium, England, and Russia), where it is said to cause a defoliation of bushes of C. avellana. This is of particular interest since, as mentioned, the affected bushes were hybrids of C. americana with C. avellana. The defoliation of European bushes has not been regarded as serious, since it occurs after the nuts have filled and does not seem to cause permanent damage to the plants.

DIVISION OF MYCOLOGY AND DISEASE SURVEY

THE RELATION OF LEAFHOPPERS TO CERTAIN STREAK SYMPTOMS ON WHEAT IN SOUTH DAKOTA

J. T. Slykhuis

During the summer and fall of 1950, evidence was obtained from field plot experiments and field inspections showing that the yellow streak mosaic of wheat was being transmitted to new plants from early June until late September in fields in certain areas of south-central South Dakota.

Leafhoppers appeared to be the most predominant insects in the fields where yellow streak mosaic was observed; hence, the more prevalent species of this group of insects were tested as possible vectors of wheat mosaic. The preliminary tests consisted of collecting the adult insects occurring in the fields in Gregory County where yellow streak mosaic was rather abundant. The leafhoppers were segregated on the basis of species and immediately colonized on wheat seedlings growing in pots in the greenhouse. Approximately ten leafhoppers were colonized to each pot of wheat plants. In some of the tests the insects were first colonized on mosaic-infected plants to be transported to the laboratory, then either transferred to healthy wheat seedlings or confined in cages where they could move freely from diseased to healthy plants. Insects used as checks were collected at Brookings where mosaic has not been found. These leafhoppers were also tested by placing them directly on healthy seedlings, or in barrier cages with diseased as well as healthy plants.

Following are the results of tests with five species of leafhoppers. [1] In all experiments in which leafhoppers collected near Brookings were used, no symptoms resembling mosaic developed on the test plants. Likewise, symptoms of mosaic did not develop in any of the tests with the species Macrosteles divisus (Uhler) or Psammatittix striatus (Linn) collected either in Gregory or Brookings County. In two of eight tests with Exitianus exitiosus (Uhler) (Stahl) and in one of eleven tests with Aceratogalia sanguinolenta (Prov.) collected in Gregory County, only one plant in ten developed symptoms of yellow streak mosaic. It must, however, be considered that these instances could have been the result of accidental infection. However, symptoms resembling mosaic developed in 29 to 36 days on 10 to 100 percent of the plants in 12 tests in a total of 15 with collections of the leafhopper, Endria inimica (Say) from Gregory County fields. It should be mentioned that these symptoms induced by E. inimica were not proven to be those of yellow streak mosaic. On the contrary the symptoms differ from those produced by the yellow streak mosaic virus in several respects. The symptoms have not been reproduced on other wheat plants by means of the manual methods which transmit streak mosaic quite readily. The symptoms appear to develop more slowly than those of streak mosaic. In these tests the earliest symptoms did not appear until 29 to 36 days after the insects had been placed on the plants; whereas, yellow streak mosaic symptoms were evident on seedlings as early as eight days after emergence, in plantings in mosaic infected fields during the summer of 1950. The leaf symptoms are likewise different. On Minter and Rushmore wheat the leafhopper-induced symptoms consist primarily of rather sharply defined, narrow, chlorotic streaks in the leaves with brown necrotic spots developing later, especially in the case of Minter. In contrast, the symptoms of yellow streak mosaic include rather vaguely defined streaks with a more predominant yellow mottling and general yellowing of the leaves. Both conditions may cause severe stunting and early death to plants that develop symptoms at an early stage.

During the early summer of 1951 symptoms similar to those induced by E. inimica as described above were recognized on winter wheat in widely scattered parts of southern South Dakota. These symptoms were most abundant in Gregory and Tripp Counties in fields where yellow-streak mosaic was rather common, but they were also observed in some areas where no streak mosaic was found. Although repeated tests have been made, in no instance has transmission been obtained by manual methods from diseased plants to healthy wheat. Nymphs of E. inimica were collected during June and July 1951 in fields where the streak symptoms occurred. These nymphs were then colonized on healthy seedlings for about two weeks. In each instance to date a high proportion of the plants have developed symptoms, like those induced by adult insects in the earlier tests; whereas, insects of the same species collected at Brookings have not induced such symptoms.

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[1] The species of leafhoppers were identified by Professor H. C. Severin, Head of the Department of Entomology and Zoology of South Dakota State College, who also gave helpful suggestions during the course of the experimental work.

Further tests are in progress to determine whether or not the streak symptoms described are definitely caused by a leafhopper transmitted virus, or whether there is a possibility that the cause is of a non-virus nature. At any rate it should be acknowledged that an additional disease exists which under certain conditions may be confused with yellow-streak mosaic, but which is quite distinct from the latter disease and appears to be dependent on the presence of a certain very widely distributed and abundant species of leafhoppers.

PLANT PATHOLOGY DEPARTMENT, SOUTH DAKOTA STATE COLLEGE, BROOKINGS

WILD AND FORAGE GRASSES FOUND TO BE SUSCEPTIBLE TO THE WHEAT STREAK-MOSAIC VIRUS[1]

H. H. McKinney and Hurley Fellows

Of the 88 grass species, in addition to those in the three genera, Agropyron, Secale, and Triticum, that were tested in the greenhouse at Arlington Farms, Virginia, or at Beltsville, Maryland, the 24 listed below were found to be susceptible to the wheat yellow streak-mosaic virus (Marmor virgatum McK.) (2), (wheat virus 7) (1). The reactions of each species are indicated by the symbols in the column to the right, and these are explained in the legend.

ANNUALS

Species	Common Name	Number or Source	Reactions
Aegilops crassa[a]		Sando	(M)
A. cylindrica[a]	Jointed crabgrass	Sando	(M)
A.ovata[a]		Sando	(M)
A. triuncialis[a]	Barb goatgrass	Sando	(M P)
A. ventricosa[a]		Sando	(M)
Bromus japonicus[a]	Japanese chess	Field collection	(M)
Digitaria ischaemum	Smooth crabgrass	Field collection	(M)
Hordeum murinum		Sando	(M P)
H. gussonianum	Mediterranean barley	Sando	(M)
Hordeum sp. ("yurasaki mochi")		Sando	(M)
Haynaldia villosa		Sando	(M)
Phalaris paradoxa		FPI 119 667	(M P)
Setaria viridis	Green bristle grass	Field collection	(L M)

[a]Winter annual

PERENNIALS

Species	Common Name	Number or Source	Reactions
Bouteloua hirsuta[b]	Hairy grama	No. 107, Rogler	(C)
Elymus canadensis[b]	Canada wild-rye	P 2623, Comstock	(C L M)
E. condensatus	Giant wild-rye	P 5797, Comstock	(L P)
E. giganteus		P 208, Comstock	(L P)
E. virginicus	Virginia wild-rye	Field collection	(M)
Eragrostis trichodes[b]	Sand lovegrass	No. 1231, Rogler	(M)
Oryzopsis hymenoides	Indian ricegrass	P 2575, Comstock	(C P)
Poa bulbosa	Bulbous bluegrass	P 4874, Comstock	(L M)
P. compressa	Canada bluegrass	P 410, Comstock	(M P)
P. stenantha		W 416, Comstock	(C P)
Stipa robusta	Sleepy grass	48-36, Comstock	(M)

Legend: C=virus carrier, no signs; L=local lesions; M=mosaic; P=part of population infected

[b]Important range or pasture species

[1]Seed used in these studies was supplied by Mason A. Hein, V. E. Comstock, G. A. Rogler, W. J. Sando, and others. The species collected in the field in Kansas were identified by Kling Anderson.

In western Kansas, streak mosaic has been collected by the writers in Aegilops cylindrica, Bromus japonicus, Elymus virginicus, and Setaria viridis, growing along roadways. The virus was isolated from part of these by Fellows, in the Botany Department of the Kansas Agricultural Experiment Station, Manhattan, Kansas. In South Dakota, Slykhuis (5) reports finding streak-mosaic virus in Setaria viridis, and he has infected this grass with the virus experimentally.

Range and pasture areas have not been surveyed for the disease, but since several range and pasture grasses have been infected experimentally, it is reasonable to believe that careful search may reveal the virus in some of these grasses. It is of interest that four of the perennial species carried the virus, though they did not express mosaic in these tests.

All sources of seed of a species have not given uniform results in different tests, and with some species, the populations of plants of some species do not react uniformly to the virus. It is reasonably evident that some of this irregularity has a genetic basis, but it is believed that the methods of inoculation are involved also. Species having very hard foliage or very fine hair-like leaves are very difficult to inoculate by the carborundum-wipe and spray methods used in these studies (3, 4).

Further study is necessary to determine any role played by these grasses as natural reservoirs for the virus, and as hosts for some insect that may serve as a vector in the transmission of the virus to wheat. More complete information is needed regarding the persistence of the virus in field grown plants, as the virus seems not to persist for long periods in some of the perennials when cultured in pots in the greenhouse.

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DIVISION OF CEREAL CROPS AND DISEASES, U. S. DEPARTMENT OF AGRICULTURE, BUREAU OF PLANT INDUSTRY, SOILS, AND AGRICULTURAL ENGINEERING

SMALL GRAIN DISEASES WERE LIGHT IN THE SOUTHEASTERN COASTAL PLAIN 1950-51

Robert W. Earhart

Diseases were not a serious factor in small grain production during the past season owing to cool weather from late November until the middle of April. (See Table 1). Injury, however, was reported on oats from the cold weather the last week in November and the first week in February. This damage varied from light (slight leaf injury) in the Gainesville area to heavy (abandoning of some fields) in western Florida. In other areas damage depended upon location and degree of protection.

Table 1. Summary of the daily highs and lows in temperature recorded at four of the experiment stations of the Southeastern Coastal Plain during the extremes in cold during November 1950 and February 1951. [a]

Date	Tifton, Georgia		Gainesville, Florida		Quincy, Florida		Jay, Florida	
	High	Low	High	Low	High	Low	High	Low
1950								
November								
23	--	--	--	--	--	--	74	42
24	73	42	73	50	75	40	65	33
25	58	10	70	23	57	19	38	19
26	28	15	46	22	34	20	57	20
27	55	26	56	32	58	30	58	27
28	56	26	61	33	64	26	58	25
29	51	25	58	32	58	27	59	27
30	54	26	59	30	58	29	77	36
December								
1	61	35	70	42	76	45	78	48
2	74	50	79	53	78	49	72	59
1951								
January								
31	75	50	79	52	77	48	69	44
February								
1	70	59	83	58	78	53	68	28
2	66	17	80	29	54	17	28	14
3	33	20	41	26	32	15	43	11
4	44	20	52	30	46	20	58	18
5	54	26	63	35	57	26	60	27
6	60	28	65	42	62	37	64	34
7	61	39	74	53	63	46	61	45

[a] Recorded temperatures are courtesy of the Georgia Coastal Plain Experiment Station, Tifton; West Florida Experiment Station, Jay; North Florida Experiment Station, Quincy; and the Florida Experiment Stations, Gainesville.

RUSTS: Crown rust of oats (Puccinia coronata avenae), normally the most damaging disease of the area, did not appear naturally until the middle of April, at which time the crop was developed so that serious damage by rust was unlikely. Stem rust of oats (P. graminis avenae) was not observed in the area.

Leaf rust of wheat (Puccinia rubigo-vera tritici) appeared early in January and was present for the rest of the season. In the nursery damage to susceptible lines was severe, but the disease did not spread owing to the cool weather in February and March. Field plantings of relatively resistant varieties escaped with only light infection.

Leaf rust of rye (Puccinia rubigo-vera secalis) was present from the first of February until harvest. Infection varied from light to moderate causing only light damage in the crop. Yields of grain were exceptionally good this season in spite of heavy localized leaf rust infections in some areas. Stem rust of rye (P. graminis secalis) was collected late in the season, but did not cause appreciable damage.

LEAF SPOTTING DISEASES: Oat leaf blotch (Helminthosporium avenae) was the most serious disease of this type this past season. It was present in the field and nursery plantings from the time the seedlings emerged until harvest. Damage was severe on very susceptible lines in both field and nursery plantings.

Spot blotch of wheat and barley (Helminthosporium sativum) was present, but did not develop into epidemic proportions on barley until about the first of April. In the previous season this disease killed all susceptible lines in the nursery by about January 15. On wheat, spot blotch was not of any significance at any time during the season.

Other leaf disorders could be attributed to cold injury and the invasion of secondary organisms associated with this injury, nutritional deficiencies and insect attacks. These were present in scattered areas, but generally in small amounts. Following the severe cold spells, however, some minor mineral element deficiencies became quite pronounced, especially on areas where their availability was influenced by high lime.

CULM ROTS AND SEEDLING BLIGHTS: Victoria blight (Helminthosporium victoriae) was not noted even though many susceptible varieties were grown and observed throughout the season.

Culm rot, apparently a new oat disease, has been under observation during the past year. This disease is caused by a Helminthosporium similar in morphology to H. victoriae and H. sativum, but more closely resembling the latter. This disease has many symptoms in common with Victoria blight, i.e., darkening of the internodal tissues, darkening and fuzziness of the nodes due to conidiophore development, culm breaking, light and blasted panicles, and heavy lodging in severe infections. However, differences in the two diseases were observed. Varieties of various parentage are susceptible to this condition. This was very little, if any, reddening or half-striping of the leaves, lodging did not occur until the panicles began to fill, and culm infections sometimes progressed along the entire culm, even into the rachis.

This culm rot was noted last season, but was confused with Victoria blight, despite the fact that varieties resistant to Victoria blight were being attacked. Southland (C.I. 5207), a new oat variety released last fall by the Florida Experiment Stations, is completely susceptible to this disease. Because of the wide interest in this variety, culm rot has assumed special interest in the area. It should be pointed out that many other varieties are susceptible to this disease, but only a few are more severely damaged.

SPECIAL DISEASES: Halo blight (Pseudomonas coronafaciens), a bacterial disease common in the northern oat-growing areas, appeared locally in North Florida. It was noticed that many of the affected areas coincided with heavy infestations of young grasshoppers. With the advent of warmer weather in March the symptoms of this disease disappeared.

Bacterial stripe (Pseudomonas striafaciens) was noted in the nursery at Gainesville about the middle of February, but it also disappeared with the warmer weather of March.

DIVISION OF CEREAL CROPS AND DISEASES, GAINESVILLE, FLORIDA

COOPERATIVE SEED-TREATMENT TESTS ON SMALL GRAINS IN 1951

R. W. Leukel

In the spring and summer of 1951 eighteen fungicides were tested for the control of bunt in wheat, and nine of these were tested also for the control of the smuts in oats and of stripe disease and covered smut in barley.

Bunt-susceptible Ulka wheat was supplied by Frances McNeal, Bozeman, Montana; smut-infected Canadian oats by H. C. Murphy, Ames, Iowa; Moore barley, infected with covered smut, was furnished by D. C. Arny, Madison, Wisconsin; and stripe-diseased Atlas barley was sent from Davis, California by C. A. Suneson.

Bunt inoculum for the Ulka what was contributed by W. E. Brentzel, Fargo, North Dakota; R. M. Caldwell, La Fayette, Indiana; C. S. Holton, Pullman, Washington; and C. V. Lowther, Beltsville, Maryland.

The writer is extremely grateful to these cooperators for their generous and timely contributions of essential materials and also to the following, who cooperated in planting the treated seed and taking the data on infection:

Aberdeen, Idaho	Harland Stevens (H. A. Rodenhiser)
Ames, Iowa	C. S. Reddy W. C. Haskett
Blacksburg, Virginia	C. W. Roane
Bozeman, Montana	Frances McNeal (H. A. Rodenhiser) F. C. Petr
Fargo, North Dakota	W. E. Brentzel
La Fayette, Indiana	R. M. Caldwell
Madison, Wisconsin	D. C. Arny
Pullman, Washington	C. S. Holton
St. Paul, Minnesota	M. B. Moore
Urbana, Illinois	Benjamin Koehler

Data were not received from La Fayette or St. Paul.

The following fungicides were applied to portions of all four seed lots:

Ceresan M -- 7.7 percent ethyl mercury p-toluene sulfonanilide (3.2 % Hg). Applied both as a dust and as a slurry, it was used somewhat as a standard of comparison because it has been in common use for several years. It is made by E. I. Dupont de Nemours and Company, Wilmington, Delaware.

Aagrano 350 -- 3 1/2 percent ethoxy propyl mercury bromide (? % Hg). It is made in two forms, one for dust and one for slurry application. It will be marketed by Mathieson Chemical Corporation, Baltimore, Maryland.

Agrox -- 6.7 percent phenyl mercury urea (4% Hg). This is applied as a dust and is marketed by Chipman Chemical Company, Boundbrook, New Jersey.

L-224, a zinc mercury chromate dust fungicide produced by Carbide and Carbon Chemicals Corporation, New York, with the empirical formula $7ZnO \cdot 2HgO \cdot 2CrO_3 \cdot 7H_2O$.

Dynacide -- 5 percent phenyl mercury ethylene diamine acetate (3% Hg). It was applied as a dust, but a wettable formulation is also available. It is produced by O. E. Link Company, Clifton, New Jersey.

Leytosan -- 7.2 percent phenyl mercury urea (4.3% Hg). It was applied as a dust but may be used also as a slurry. It is a product of F. W. Berk & Company, London, England and New York City. The material used was two years old.

K. F. 467 -- 10 percent ethyl Hg perthio cyanate (? % Hg). This is an experimental dust that has been widely tested with generally favorable results. It is a product of Rohm and Haas, Philadelphia, Pennsylvania, but is not yet commercially available.

Mercuran -- methoxy ethyl mercuric acetate (3 1/2% Hg). It is made in two forms; one (A.S.) is applied as a dust and the other (A.L.) is completely soluble in water and may be applied either as a "quick wet" treatment, or in more dilute form in a slurry treater. It is produced by Delmar Chemicals Ltd., Lachine, Quebec. The samples used were two years old.

Panogen -- 2.1 percent methyl mercury dicyan diamide (1.4% Hg). This is a liquid treatment applied by the "quick wet" method, generally in a machine designed especially for that purpose. Experiments in 1951 indicate that it may be equally effective when diluted with nine parts of water and applied in a slurry treater. It is distributed by Panogen, Inc., New York.

The following nine materials were tested on Ulka wheat only:

Vancide 51 -- 30 percent sodium salts of dimethyl dithio carbamic acid and 2-mercaptobenzothiazole. It is in liquid form and is a product of R. T. Vanderbilt Company, Inc., New York.

Arasan -- 50 percent thiram (tetramethylthiuram disulfide). It is a Dupont product and was applied as a dust. The wettable form, Arasan S. F. (70% thiram) was not used.

Copper carbonate -- 50 percent metallic copper.

Phygon -- 50 percent dichloronaphthoquinone. This was applied as a dust. It is produced by the Naugatuck Division of U. S. Rubber Company. A slurry form of Phygon is also available.

Spergon -- 98 percent tetrachloro para benzo quinone. It was applied as a dust, and is also a U. S. Rubber Company product.

C & C 640 -- a zinc copper chromate dust with the empirical formula $ZnO \cdot 4CuO \cdot CrO_3 \cdot xH_2O$.

C & C 5400 -- A complex organic microfine dust, a reaction product of dimethyl dithio carbamate and sulfur dichloride. These two materials are products of Carbide and Carbon Chemicals Corporation, New York.

Parson's Seed Saver Dust -- a complex quarternary ammonium compound (3.8% Hg) made by Parson Chemcial Works, Grand Lodge, Michigan.

Anticarie -- 20 percent hexachloro benzene. This is a dust bunticide produced originally in France and is marketed in the United States by H. P. Rossiger & Company, New York, and in Canada by French Dyestuffs Ltd., Hamilton, Ontario.

Several materials, not generally considered as wheat seed treatments, were included in these tests, so that in case of a critical shortage of the better fungicides, fairly satisfactory substitutes could be recommended.

The general experimental procedure was similar to that described in reports of previous cooperative experiments (1) (2).

A 500 cc. sample of seed was used for each fungicidal material tested. This sample, taken volumetrically, expedites the conversion of ounces-per-bushel to grams-per-sample (3). A 500 cc. sample is approximately 1/70 of a bushel. If the rate of application of the fungicide is 1/2 ounce (14.17 grams) per bushel, a 500 cc. sample will require 1/70 x 14.7 grams or 0.2 gram. Rates of 1, 2, 3 or 4 ounces per bushel are easily converted to 0.4, 0.8, 1.2 and 1.6 grams per 500 cc., respectively. This simplifies calculations involving bushel weights of different crop seeds, and also avoids the error involved in treating light chaffy seed as compared with heavy plump seed. On a weight basis the light seed needs more fungicide per bushel than does the heavy seed.

Five materials were applied in slurry or liquid form. Ceresan M and Aagrano slurries were prepared by mixing 10 grams of dust in 150 cc. of water. By applying 3 cc. of this suspension to 500 cc. of seed, the required 0.2 gram of chemical was added to the sample, along with approximately 0.8 percent of water (by weight) to wheat, 1 percent to barley and 1.4 percent to oats.

Panogen was applied at 3/4 ounce or 21 grams per bushel. This is equivalent to 0.3 gram or 0.3 cc. per 500 cc. sample when applied in concentrated form by the "quick wet" method. In the dilute form one part of Panogen was diluted with 9 parts of water and 3 cc. of this diluted mixture was applied to a 500 cc. sample of seed.

Mercuran A.L. was diluted by adding 10 cc to 150 cc. of water and 3 cc. of this solution was applied to a 500 cc. sample of seed. The specific gravity of these materials (1.03 to 1.08) is not great enough to be an important factor in these calculations.

The Ulka wheat, inoculated with viable bunt spores at a 1 to 150 spore dosage, was treated February 16. The seed was stored in open glass containers in the laboratory until it was time to packet it for shipment to the eight field stations for planting. Germination tests were made in steamed soil 2 months and 6 months after treatment.

The stripe-infected Atlas barley was treated March 2, and germination tests in soil were made one week and again 22 weeks after treatment. Seed was sent to four stations for field planting.

The Moore barley was treated March 14 and germination tests of seed stored in sealed cans and in open cans were made 3 weeks and 19 weeks after treatment. Seed was sent to eight field stations for planting.

Table 1. Percent emergence from treated seed of smutty Ulka wheat after storage for 2 months and for 6 months at room temperature and then planted in steamed soil held at 15° C. for 4 days and then at 25° C. until emergence; and, percent of smutted heads grown from this seed in field plots at seven stations, 1951.

No.	Name of material	Seed treatment[a] Rate bu.	Rate per 500 cc.	Percent emergence after 2 mos.	Percent emergence after 6 mos.	Percent infection in plots planted at Urbana, Ill.	Madison, Wis.	Bozeman, Mont.	Aberdeen, Idaho	Pullman, Wash.	Fargo, N. Dak.	Beltsville, Md.	Average
		oz.											
1	Check			86	93	22.2	7.5	81.0	92.0	97	28.8	89.0	59.6
2	Ceresan M	1/2	0.2 g.	88	93	0.2	0.1	5.5	5.8	6	t	0.6	2.6
3	Aagrano	"	"	93	93	3.0	0.1	7.3	6.1	16	0.5	8.5	5.9
4	Agrox	"	"	87	88	11.0	0.4	16.8	21.8	54	1.5	0.8	15.2
5	L-224	"	"	90	93	9.0	0.3	31.1	31.7	73	2.0	8.9	23.3
6	Dynacide	"	"	89	93	9.0	0.4	21.3	33.1	62	5.4	1.7	19.0
7	Leytosan	"	"	92	91	8.0	0.7	15.6	24.0	55	2.1	1.3	15.2
8	K.F. 467	"	"	91	91	.5	0	1.9	2.6	2	t	0	1.0
9	Mercuran A. S.	"	"	94	92	8.0	0.4	16.2	9.7	31	4.6	3.1	10.4
10	Ceresan M slurry	"	3cc.	93	91	.2	0	1.5	0	t	0	0.1	0.3
11	Aagrano slurry	"	3cc.	90	85	0	0	.4	0	0	0	0	t
12	Panogen (conc.)	3/4	0.3cc.	94	94	0.6	0	2.2	0.5	4	0	0	1.0
13	Check			88	91	22.0	12.4	85.0	95.0	97	36.8	91.0	62.7
14	Panogen (dilute)	3/4	3cc.	94	93	0	0	1.0	0	0	0	0	t
15	Mercuran A.L.	1/2	3cc.	92	95	0.3	0	.9	0.7	t	0	0	0.3
16	Vancide 51	3	4cc.	95	93	2.0	0.1	11.2	11.9	28	0.4	5.1	8.4
17	Arasan	1	0.4 g.	92	93	2.0	0	20.4	16.8	36	4.3	3.0	11.8
18	Copper carbonate	2	0.8 g.	89	89	1.0	0	7.0	--	10	0.6	0.6	2.7
19	Phygon	1	0.4 g.	90	87	1.0	0.1	2.0	12.1	12	0.8	0.1	4.0
20	Spergon	1	0.4 g.	92	89	.7	0	4.2	8.7	7	0.3	0.3	3.0
21	C & C 640	1	0.4 g.	90	90	.3	0	4.3	25.6	4	0.3	0.3	5.0
22	C & C 5400	1	0.4 g.	89	88	1.0	0.2	9.9	22.5	26	0.6	2.4	9.0
23	Parson's S.S. Dust	1/2	0.2	87	89	18.0	4.6	58.8	64.5	97	16.8	91.0	53.0
24	Anticarie	1/2	0.2	88	92	5.0	0.1	9.0	2.4	11	7.0	1.6	3.7

[a] Treatments 10 and 11 were applied as slurries; 12 was applied as a concentrated "quick-wet" treatment; and 14 and 15 were applied like slurries except that the active ingredients were in solution instead of being in suspension. The remaining materials were applied as dusts.

Table 2. Percent emergence in Canadian Oats, Moore Barley and Atlas Barley from seed, untreated, or treated as shown, and planted in pans of steamed soil, 50 percent saturated and kept at 15° C. for four days after planting, and then at 25° C. until after emergence; Beltsville, Maryland, 1951.

No.	Seed treatment: Name of material	Amount per bu.	Amount per 500 cc.	Moore barley stored in sealed cans: 3 weeks	Moore barley stored in sealed cans: 19 weeks	Moore barley stored in open cans: 3 weeks	Moore barley stored in open cans: 19 weeks	Atlas barley in open cans: 1 week	Atlas barley in open cans: 22 weeks	Canadian oats stored in sealed cans: 1 week	Canadian oats stored in sealed cans: 18 weeks	Canadian oats stored in open cans: 1 week	Canadian oats stored in open cans: 18 weeks
		oz.											
1	Untreated			91	91	91	91	97	97	90	90	90	90
2	Ceresan M	1/2	0.2 g.	92	94	93	95	97	98	91	91	93	92
3	Aagrano	"	"	90	92	93	95	95	96	91	95	93	93
4	Agrox	"	"	68	65	84	90	96	98	92	88	93	90
5	C & C - L 224	"	"	93	92	91	91	98	96	92	93	93	91
6	Dynacide	"	"	93	91	92	91	97	96	95	94	95	92
7	Leytosan	"	"	90	90	93	93	97	97	94	93	93	91
8	K.F. 467	"	"	95	90	93	95	97	96	96	96	95	92
9	Mercuran A.S.	"	"	91	92	95	96	99	97	92	90	94	93
10	Ceresan M [a]	"	3 cc.	93	91	93	95	97	98	92	90	92	91
11	Aagrano [a]	"	"	92	85	92	96	97	98	95	96	95	94
12	Panogen [b]	3/4	0.3 cc.	92	90	93	94	98	98	93	90	95	94
13	Panogen [c]	3/4	3 cc.	92	93	93	96	97	96	94	93	96	95
14	Mercuran [c]	1/2	3 cc.	91	86	96	93	98	97	92	90	95	95

[a] Applied as a slurry
[b] Applied as a concentrated liquid
[c] Applied diluted equivalent to a slurry

Table 3. Occurrence of stripe disease in Atlas barley and its control by fungicides at three stations, 1951.

No.	Seed treatment [a]: Fungicide	Rate per bu.: oz.	Rate per 500 cc: g.	Rate per 500 cc: cc.	Percent infected plants from seed planted at - Beltsville, Maryland: March 6	Beltsville, Maryland: March 29	Beltsville, Maryland: April 16	Madison: Wis.	Fargo: N. Dak.	Average infection percent
1	Check	--	--	--	27.0	25.0	5.0	1.8	1.5	12.1
2	Ceresan M	1/2	0.2	--	0	0	0	0	0	0
3	Aagrano	"	"	--	0	0	0	0	0	0
4	Agrox	"	"	--	0	0	0	0	0	0
5	C & C L-224	"	"	--	0	0	0	0.5	0.5	0.2
6	Dynacide	"	"	--	0.6	0	0	0	0.1	0.1
7	Leytosan	"	"	--	0.6	0	0.6	0	0.2	0.3
8	K.F. 467	"	"	--	0	0	0	0	0	0
9	Mercuran A. S.	"	"	--	0	0	0	0	0	0
10	Ceresan M slurry	"	"	3.0	0	0	0	0	0	0
11	Aagrano slurry	"	"	3.0	0	0	0	0	t	t
12	Panogen (concentrated)	3/4	0.3	0.3	0	0	0	0	0	0
13	Panogen (dilute)	3/4	0.3	3.0	0	0	0	0	0	0
14	Mercuran A. L.	1/2	0.2	3.0	0	0	0	0	0.9	0.2

[a] Numbers 2 to 9 were applied as dusts; numbers 10 and 11 were slurry treatments, number 12 was a "quick wet" treatment -- 3/4 fluid ounce of concentrated liquid per bushel; in number 13 this amount was diluted with 9 parts water; in number 14, a solution of 10 grams in 150 cc. was used and applied like a slurry.

Table 4. Control of loose and covered smuts in Canadian Oats grown from naturally-infected seed treated as shown and sown in field plots at stations in nine States, 1951.

No.	Seed treatment[a] Material	Rate per bu.	per 500 cc.	Percent infection in plots planted at - Urbana, Ill.	Madison, Wis.	Bozeman, Mont.	Aberdeen, Idaho	Pullman, Wash.	Fargo, N. Dak.	Beltsville, Md.	Blacksburg, Va.	Ames, Iowa	Average
		oz.											
1	Check		--	32.0	29.6	11.9	22.5	22.0	23.6	26.9	18.3	9.6	21.8
2	Ceresan M	1/2	0.2 g.	0.3	0.1	0	0	0	0	0	0	.2	t
3	Aagrano	"	"	0	0.1	0.1	0.1	0	t	0	0	.3	t
4	Agrox	"	"	4.7	2.6	0.5	3.8	2.0	3.3	1.2	1.4	2.0	2.4
5	L-224	"	"	19.3	24.7	7.5	20.0	12.0	14.7	9.0	14.7	6.3	14.2
6	Dynacide	"	"	7.8	7.0	2.7	9.6	7.0	8.6	5.2	7.8	4.3	6.7
7	Leytosan	"	"	7.3	7.0	2.8	7.0	6.0	10.0	2.5	7.4	7.3	6.4
8	K.F. 467	"	"	5.5	5.2	3.0	4.7	2.0	5.3	4.9	6.9	6.2	4.9
9	Mercuran A.S.	"	"	3.1	1.4	0.5	1.4	1.0	4.3	0.5	1.7	2.0	1.8
10	Ceresan M (sl.)	"	3 cc.	0.1	0.1	0	0.1	0	0	0	0	0.2	t
11	Aagrano (sl.)	"	3 cc.	0.1	0	0	0.2	0	0	0	0	0	t
12	Panogen (conc.)	3/4	0.3 cc.	0	0	0	0	0	0	0	0	0	0
13	Panogen (dilute)	"	3 cc.	0.3	0	0	0	0	0	0	0.1	0	t
14	Mercuran A.L.	1/2	3 cc.	3.7	9.6	3.1	10.0	7.0	15.9	6.2	8.1	3.8	7.5

[a] Treatments 2 to 9 were applied as dusts; 10 and 11 were slurry treatments; 12 was applied as a "quick wet treatment"; in number 13 the same amount of Panogen was used diluted with 9 parts of water; in number 14, 10 grams were dissolved in 150 cc. solution and 3 cc. added to sample.

Seed of Canadian oats was treated March 15 and germination tests were made of seed stored in sealed cans and in open cans one week and again 18 weeks after treatment. Seed was sent to 10 field stations.

Experimental Results

Wheat: -- None of the treatments had any appreciable effect upon germination in steamed soil 2 months and 6 months after treatment (Table 1).

The heavy application of viable bunt spores to the seed of highly susceptible Ulka wheat resulted in extremely high percentages of infection at Aberdeen, Beltsville, Bozeman, and Pullman, and relatively poor control by many of the fungicides, especially at Pullman. The only fungicides that reduced the average of the infection percentages at all the stations to 1 percent or less were Aagrano slurry, Panogen (diluted), Ceresan M slurry, Mercuran A.L., Panogen (concentrated) and K.F. 467. It will be observed that all of these except K.F. 467 were applied in slurry or liquid form.

Ceresan M (dust), copper carbonate, Spergon, Aagrano (dust), Phygon, C & C 640, and Anticarie, more or less in that order of effectiveness, were among the treatments that were fairly satisfactory at several stations where infection in the checks was high. Vancide and Arasan were somewhat less effective. Agrox, Leytosan, Dynacide and L-224, while effective at some stations, failed at others and can hardly qualify as bunticides under conditions of severe infection. Parson's Seed Saver Dust, as has been shown in previous experiments, is almost worthless as a cereal seed treatment.

It would be difficult to explain satisfactorily the wide differences in bunt control obtained at different stations with some of the fungicides. For example, at Pullman, Bozeman, Aberdeen, and Beltsville, with infection in the checks averaging 97, 83, 93.5, and 90 percent respectively, Spergon reduced it to less than 5 percent at three of these stations but allowed over 25 percent at Aberdeen. In contrast to this, L-224 reduced infection at Aberdeen and Bozeman to less than half as much as occurred at Pullman. At Urbana with only 22 percent bunt in the checks, Agrox allowed 11 percent infection while at Beltsville, where the check showed 90 percent, Agrox reduced it to 0.8 percent.

These and other seeming inconsistencies may be partly explained, perhaps, by the heavy spore load on the seed, combined with extreme variation in the environmental conditions that favor bunt development, fungicidal efficiency or both.

It goes without saying that few farmers would sow seed wheat, carrying a 1 to 150 spore load, and therefore bunt control on the average farm undoubtedly would be more effective than under the above severe experimental conditions.

Barley: -- Data on the control of stripe disease in Atlas barley were obtained from only three stations (Table 3). All of the treatments used reduced the incidence of stripe-disease to less than 1 percent, while eight of them eliminated it entirely. With possibly one exception, none of the treatments affected germination and emergence adversely.

Not enough smut developed in plants from untreated seed of Moore barley to produce significant data on control. At Beltsville, only one smutted head was found in the checks. At Fargo an average of 1.6 percent (29 heads) appeared in the checks and 10 of the treatments gave complete control. Agrox reduced infection to a trace (one smutted head), Dynacide to 0.2 percent, Mercuran A.L. to 0.3 and L-224 to 1 percent.

With the exception of Agrox, none of the treatments affected germination adversely, even after sealed storage for 19 weeks (Table 2).

Oats: -- Germination of oats in steamed soil was not appreciably affected by any of the treatments after storage for periods of 1 week and 18 weeks in open and sealed containers (Table 2)

Five of the treatments -- Ceresan M and Aagrano (dust and slurry), and diluted Panogen, reduced the average percentage of oat smuts to a trace, and one (Panogen concentrated) eliminated it entirely at all stations, with an average of 21.8 percent in the checks.

Mercuran dust was more nearly effective in oats smut control than was the liquid form. The opposite was true for bunt control. K.F. 467, which was very effective in controlling bunt in wheat and stripe disease in barley, was disappointing in oat smut control. Dynacide and Leytosan, both unsatisfactory in bunt control, were equally unsatisfactory for control of oat smut. L-224, an excellent fungicide for corn and sorghum, apparently is not satisfactory for small grains (Table 4).

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DIVISION OF CEREAL CROPS AND DISEASES

SORGHUM SEED TREATMENT STUDIES IN 1951

R. W. Leukel

In 1951 eighteen fungicidal materials were applied to Sharon kafir seed that had been inoculated at a 1-200 spore dosage with covered kernel smut. Thirteen of these materials have been mentioned in a preceding article dealing with seed treatment of small grains [1]. The five additional materials used on sorghum are:

N.P. 679 -- 50 percent substituted aromatic fluoride (dust) from Pennsylvania Salt Manufacturing Company.
275-D -- 50 percent pentachloro nitro benzene (dust) from Mathieson Chemical Corporation.
P.M.A.S. -- 7 percent phenyl mercuric acetate (liquid) from W. A. Cleary Corporation.
Mercusol -- 2 percent phenyl mercuric salicylate (liquid) from H. L. Woudhuysen and Associates.
C & C 5837 -- 1-4 dibromo butane from Carbon and Carbide Chemicals Corporation, New York.

The non-mercurial dusts were applied at 2 ounces per bushel (0.8 gr. per 500 cc. sample), and the mercurial dusts at 1/2 ounce, except Dynacide which was applied at the 1 ounce rate. The liquid mercurials were diluted with water so that 3 cc. of the diluted material contained the correct amount of fungicide to treat a 500 cc. sample at the desired rate. The dilutions were as follows:

Panogen -- 15 cc. plus 135 cc. of water
P.M.A.S. -- 10 cc. plus 140 cc. of water
Mercuran A. L. -- 10 cc. plus 140 cc. of water
Mercusol -- 20 cc. plus 130 cc. of water
Vancide -- 80 cc. plus 70 cc. of water

Less than 1 percent of moisture (by weight) was thus added to the seed. It is believed that these materials diluted in these proportions can be properly applied to seed in a slurry treater.

The seed was treated May 17 and germination tests in soil were made May 21 to May 29. The results are shown in Table 1.

A field planting was made June 18 in triplicated 25-foot rows. A late date-of-planting was selected in order to favor covered-smut infection. Data on infection were taken September 6 by counting the total and the smutted heads in each row. The results are shown in Table 1.

Emergence was visibly improved by most of the treatments. Mercuran A.L., N. P. 679, and 275-D showed no benefit in this respect while 5837 showed indications of injury. Thirteen out of the 18 treatments eliminated smut. Arasan allowed one smutted head, N. P. 679, 275-D and Mercuran allowed 2 each, while 5837 allowed 30 smutted heads or 9 percent infection. The checks averaged 55 percent infection. The failure of 5837 to improve emergence and to control smut, along with its very disagreeable odor, should eliminate it as a seed fungicide for sorghum.

[1] See page 445

Table 1. Percent emergence from smut-inoculated seed of Sharon kafir, untreated or treated as shown, and planted in steamed soil, 50 percent saturated and held at 20° C. for 4 days and then at 25° C until after emergence; and percent of heads infected with covered kernel smut in triplicated field plots planted one month later at Plant Industry Station, Beltsville, Maryland, 1951.

No.	Seed treatment[a] Fungicide	Rate applied per - bu.	500 cc.	sample	Emergence	Total heads	Smutted heads	
		oz.	gr.	cc.	%	No.	No.	%
1	Check	--	--	-	66	245	147	60
2	Arasan	2	0.8	-	86	339	1	0.3
3	C & C 640	2	0.8	-	91	328	0	0
4	C & C 5400	2	0.8	-	71	333	0	0
5	C & C 5837	2	0.8	-	58	330	30	9.1
6	Copper carbonate	2	0.8	-	87	302	0	0
7	N. P. 679	2	0.8	-	67	322	2	0.6
8	275-D	2	0.8	-	65	318	2	0.6
9	Phygon	2	0.8	-	87	360	0	0
10	Dynacide	1	0.4	-	88	340	0	0
11	Check	--	--	-	66	238	119	50
12	Ceresan M	1/2	0.2	-	79	222	0	0
13	Agrox	1/2	0.2	-	78	260	0	0
14	L-224	1/2	0.2	-	91	305	0	0
15	K.F. 467	1/2	0.2	-	81	289	0	0
16	Panogen	3/4	0.3	3	84	324	0	0
17	P.M.A.S.	1/2	0.2	3	79	350	0	0
18	Mercusol	1	0.4	3	75	330	0	0
19	Mercuran A. L.	1/2	0.2	3	67	355	2	0.6
20	Vancide 51	4	1.6	3	77	344	0	0

[a] Numbers 2 to 9 are non-mercurial dusts; numbers 10, 12, 13, 14 and 15 are mercurial dusts; numbers 16 to 19 are mercurial liquids applied, diluted in water, so that 0.8 percent moisture is added to the seed. Number 20 is a non-mercurial liquid similarly applied.

The experimental materials, N.P. 679 and 275-D, need further testing to establish their value as seed treatments for sorghum. Their failure to completely eliminate smut in Sharon kafir, the seed of which is free of glumes, suggests that they might fail as treatments for controlling smut in varieties with persistent glumes. The mercurials are generally preferred for seed of such varieties.

DIVISION OF CEREAL CROPS AND DISEASES

LONGEVITY OF THE TOBACCO BLACK SHANK FUNGUS IN THE SOIL IN THE ABSENCE OF TOBACCO

W. D. Valleau

The opinion of tobacco pathologists, in areas where black shank has been present for many years, as to how long the fungus persists in the soil seems to be that it will persist for several years. Clayton (Farmers' Bull. 2023) says: "The disease can persist in the soil in the absence of tobacco for at least 5 or 6 years." When the question was asked whether the supposed persistence could not as well be explained on the basis of recontamination by dirt on tools, etc., the answer usually was that it probably could. There is, therefore, probably little accurate information on the persistence of the fungus(Phytophthora parasitica var. nicotianae) in the soil in the absence of tobacco. As eradication or control of the disease may depend on this knowledge, it is worth while recording instances of eradication or successful control, particularly as successful eradication on one farm may lead to methods for complete eradication of the fungus from whole districts.

In the course of the past 15 years, sporadic cases of black shank have broken out in Kentucky in areas where the disease had not been reported before. In Owen, Nicholas, and Todd Counties outbreaks occurred between 1935 and 1939 on a single farm in each county. The fields were sown to grass, and no further reports were received of the disease on these farms or in the vicinity up to the last two years.

In 1947 the writer visited a colored farmer at Millersburg, Kentucky, who had a complete loss from black shank in two fields -- one on overflow land and the other on high land. Other tobacco crops along the creek had black shank. A program of eradication was outlined for the grower, including planting the affected fields in grass or growing some other crop than tobacco for a few years. He was warned against the use of tools that had been used in black shank land if he finally decided to grow tobacco again in these fields. He put the upland field into grass and legumes and grew corn for 3 years in the overflow field. He stopped growing tobacco on the farm for 3 years and did not use his tools or animals on black shank land. In 1951 he was forced by circumstances to put tobacco in the fields that were infested in 1946 and a total loss in 1947. He grew Ky 16. By the first of September 1951 there was no sign of black shank in the upland field, and one black shank plant was found on the overflow land along the creek. This one plant could have been the result of recontamination of the soil by overflow in the spring of 1951, as all of the plantings on both bottom land and upland along the creek were injured by black shank.

A crop of tobacco in an overflow piece of ground on Elkhorn Creek in Franklin County was heavily infected with black shank in 1947. The grower understood how the disease could be spread, and took precautions against recontamination. In 1951 the field was again planted to Ky 57, a susceptible variety, but there was no loss whatever from black shank.

A field in Owsley County was a complete loss in 1947. It was sown to grass and in 1951 planted to one of Dr. Jenkins' resistant strains of burley. Under conditions of severe infestation the loss in these strains is frequently over 50 percent and sometimes total. There was no sign of black shank in the field by the middle of August. The disease caused considerable loss in 1951 in nearby fields.

On White Oak Creek in Bath County the disease has been present since 1942. In the summer of 1943 growers were warned about the danger of the disease and advised to grow tobacco, in 1944, only in land that had not grown tobacco in 1942 or 1943. In 1944 there was no black shank along the creek except in two spots where tobacco followed diseased tobacco. Since that time one grower has followed a rotation of usually 3 years in grass between tobacco crops. He has only an occasional plant to die from black shank, probably the result of recontamination by dirty tools or shoes.

The results on the two Millersburg fields and the Franklin County field indicate that the black shank fungus may disappear completely from the soil in 3 years and a black-shank-free crop may be grown, provided there is no recontamination. In a region where most of the land is in grass and most of the farms are contaminated with black shank, it should be possible to reduce losses from black shank on any farm to virtually nothing, provided tobacco is grown on a field which has been in grass for at least 3 years and does not receive drainage from a black shank field, and provided the field does not become recontaminated by dirt on shoes, tools, work animals' feet, or in other ways. Even though an occasional plant is killed by black shank the first year, moving each year to new ground prepared and worked with clean tools should reduce the inoculum to a point where complete eradication should not be difficult.

Because of the extremely rapid spread of black shank in Kentucky during the past 2 years, sometimes over tenfold in a county, it has become necessary that some measures be taken to stop the rapid spread of the disease and to eradicate it immediately in new localities. Perhaps no other plant pathogenic fungus lends itself so well to an eradication program as the black shank fungus.

KENTUCKY AGRICULTURAL EXPERIMENT STATION, LEXINGTON

THE OCCURRENCE AND PATHOGENICITY OF PHYTOPHTHORA SPECIES WHICH CAUSE ROOT ROT OF SAFFLOWER

C. A. Thomas

Root rot was one of the more important diseases of safflower in 1950 (4) when approximately 100,000 acres of the crop were cultivated. The disease caused extensive losses of susceptible varieties in irrigated sections such as the Imperial Valley of California. It appeared that further interest in the crop in many areas would be jeopardized until resistant varieties such as N8 are available for planting or other suitable control measures are developed.

The identity, distribution, and pathogenicity of isolates of the causal organism obtained in conjunction with other studies on the disease and its control are reported here.

Claassen, Schuster, and Ray (1) first observed the disease in 1948 in plots at Scottsbluff, Nebraska. They described the disease and stated that a Phycomycete along with species of Fusarium and Alternaria were isolated from diseased plants. Erwin (2) proved that the causal organism in western Nebraska was Phytophthora drechsleri Tucker. Malaguti (3) made a study of a similar trouble in Venezuela and found the causal organism to be Phytophthora palmivora Butler.

Root rot of safflower was observed by the author during the last three years in Nebraska, Colorado, Wyoming, Kansas, Oklahoma, Texas, Arizona, California, and Maryland. Isolations were made from affected plants from many of these areas. The technique employed in making most of the isolations consisted of inserting bits of root or stem tissue into apples. Pieces of apple tissue from the advancing margin of the rot which developed around the safflower tissue were transferred to lima bean agar slants. Pure cultures of Phytophthora spp. were usually obtained by this method.

The pathogenicity of isolates was determined by inoculating one-month old safflower plants of either variety N9 or N852, both of which are susceptible to root rot, and comparing the organisms reisolated from the safflower plants with the originals.

The identity of the pathogenic isolates, and the variety of safflower and location from which they were obtained are presented in the table.

Table 1. The identity of Phytophthora isolates causing root rot of safflower in the United States.

Source		Isolates	
Location	Variety	Number obtained	Identity
Scottsbluff, Nebraska	N852	12	P. drechsleri
Scottsbluff	N9	5	"
Scottsbluff	N6	2	"
- - - - - -, Wyoming	N852	1	"
Lamar, Colorado	Indian	1	"
Calexico, California	N852	8	"
Westmorland, California	---	5	"
Hamilton City, California	N6	6	"
Beltsville, Maryland	N852	10	P. cactorum
Beltsville	N9	16	"
Beltsville	N6	4	"

All isolates obtained in the Great Plains States and in California were found to be P. drechsleri. Those from safflower in experimental plots at Beltsville, Maryland were P. cactorum.[1]

[1]The author is indebted to Professor C. M. Tucker of the University of Missouri for identifications.

The relative virulence on safflower of some isolates of P. drechsleri and P. cactorum from safflower, P. parasitica from tomato, and P. cactorum from maple was studied in the greenhouse at Beltsville. The number and identity of the isolates used in the tests were as follows: P. drechsleri, 3 isolates, all from safflower in Nebraska; P. cactorum, 3 isolates from safflower in Maryland; P. parasitica, 2 isolates, one from Dr. J. P. Fulton, University of Arkansas, and one from Dr. Bert Lear, Cornell, both from tomato; and P. cactorum, one isolate from maple obtained from Mrs. Frances Lombard at Beltsville.

Three 6-inch pots, each containing 10, one-month old safflower plants of variety N9, a susceptible variety, and 3 additional pots of variety N8, a resistant variety, were inoculated with each isolate. Inoculum consisting of triturated mycelium from 8 day old potato broth cultures suspended in water was poured on the surface of the soil in the pots. Each pot received an equal amount of inoculum. The soil temperature in the pots was maintained at approximately 25° C. Sufficient water was added twice daily to insure high moisture content.

The experiment was terminated six weeks after inoculation. At this time over 90 percent of the N9 plants inoculated with the isolates of P. drechsleri and P. parasitica were dead. Root rot killed approximately 50 percent of the N9 plants inoculated with the P. cactorum isolates from safflower. No infection was obtained with the isolate from maple. Less than 15 percent of the N8 plants were killed by any isolate. No root rot occurred in the uninoculated controls. The test was repeated once with similar results.

It is evident that although P. drechsleri is probably the principal organism involved in safflower root rot in commercial areas of production, P. parasitica is equally virulent and both organisms are more virulent than P. cactorum. Variety N8 appears to be resistant to all three organisms.

Summary

Root rot of safflower was observed in commercial fields in several Great Plains States, Arizona, California, and in experimental plots at Beltsville, Maryland. Isolations from affected plants in the principal safflower growing areas of the Great Plains and California yielded cultures of Phytophthora drechsleri. Isolates from diseased plants at Beltsville were identified as P. cactorum. Isolates of P. parasitica from tomato were pathogenic on safflower in greenhouse inoculation tests. P. parasitica and P. drechsleri were equally virulent and both were more virulent than P. cactorum on the susceptible safflower variety N9 in the greenhouse tests. Variety N8 was resistant to all isolates tested.

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DIVISION OF TOBACCO, MEDICINAL, AND SPECIAL CROPS.

EVALUATION OF FUNGICIDES FOR CONTROL OF THE LEAF-SPOT DISEASE OF GLADIOLUS CAUSED BY BOTRYTIS GLADIOLORUM TIMMERMANS[1]

Arthur Holloman, Jr., and Roy A. Young

The fungus, Botrytis gladiolorum Timmermans, may cause a leaf spot, flower spot, and corm rot of gladiolus. The pathogen is the limiting factor in commercial production in several sections of the United States where the gladiolus is grown primarily for sale of cut flowers. The leaf and flower spot phases of the disease are not usually a factor in commercial gladiolus production in Oregon, except in fields where overhead irrigation is used or where air movement is restricted. Normally the humidity is too low for widespread development of the disease until fall rains start in September, well after the blooming period. The foliage may be destroyed, although such destruction usually occurs too late in the season to be an important factor in the sizing of corms. However, the accompanying build-up of the pathogen may result in large losses from Botrytis corm rot in the ground and later in storage.

Fungicide evaluation trials were conducted in 1949 and 1950 to select those materials most effective in control of Botrytis leaf spot of gladiolus under Oregon conditions. The effectiveness of 16 chemicals in inhibiting germination of spores of B. gladiolorum was measured. Spore germination trials were conducted on plates of two percent agar and one percent dextrose to which chemicals had been added to give the desired concentrations. Five of the most promising fungicides were selected for field evaluation.

In 1949 a plot was established cooperatively with a grower approximately 10 miles southwest of Portland and in 1950 a similar plot was laid out on the Horticulture farm at Corvallis. In both plots overhead sprinkler irrigation was used. The variety Pandora was used in 1949 and Snow Princess was used in 1950. In each case a five by five latin square field plot design was used. Each replication consisted of 30 feet of row in 1949 and 20 feet of row in 1950. Corms were planted at the rate of 6 per foot of row. Sprays were applied weekly starting approximately August 1, before Botrytis leaf spot had appeared. A 3-gallon Hudson sprayer operated at a pressure of about 50 pounds was used for all spraying.

A modification of the formula suggested by McKinney[2] was used for data assessment. In October, twenty-five plants were selected at random from each replication and cut at ground level. The samples were taken to the laboratory and approximately 100 leaves were counted at random from each sample. Five grades of disease were set up as follows:

0 - No Botrytis lesions
1 - 0 to 5 percent of leaf area necrotic
2 - 5 to 25 percent of leaf area necrotic
3 - 25 to 50 percent of leaf area necrotic
4 - 50 to 100 percent of leaf area necrotic

Each sample was graded into the above classes and a disease index was derived and placed on the basis of 100 percent by application of the formula

$$\frac{X(0) + X(1) + X(2) + X(3) + X(4)}{4t}$$

where X = number of leaves in each class
t = total number of leaves counted
4 = number of highest disease class.

The accuracy of such a formula in evaluating levels of plant disease has been well established.[2, 3]

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[1]Published with the approval of the Director of the Oregon Agricultural Experiment Station as technical paper no. 701.

[2]McKinney, H. H. Influence of soil temperature and moisture on infection of wheat seedlings by Helminthosporium sativum. Jour. Agr. Res. 26: 195-217. 1923.

[3]Horsfall, J. G. and J. W. Heuberger. Measuring magnitude of a defoliation disease of tomatoes. Phytopath. 32: 226-232. 1942.

RESULTS

The materials used in the trials, concentration, and degree of disease control as indicated by a computed disease index are shown in Tables 1 and 2.

Table 1. Control of Botrytis leaf spot by different fungicides in 1949 as indicated by a computed disease index.

Fungicide and quantity used in 100 gallons of water	Disease index in replication					Average disease index
	I	II	III	IV	V	
Ferbam 2 lbs.	11.75	12.50	17.50	13.61	13.97	13.86*
Nabam 2 qts.	12.00	20.00	25.25	19.75	16.08	18.61*
Phygon XL 1 lb.	18.68	37.09	29.75	34.00	26.25	29.15*
Puratized Agr. Spray 1 qt.	36.36	34.50	31.93	27.50	39.00	33.85*
Untreated check	55.00	37.75	43.80	46.68	40.09	44.62

All spray mixtures contained Rohm and Haas Triton B1956 1/2 pt./100 gal.
* Least significant difference at the one percent level 9.52.

Table 2. Control of Botrytis leaf spot by different fungicides in 1950 as indicated by a computed disease index.

Fungicide and quantity used in 100 gallons of water	Disease index in replication					Average disease index
	I	II	III	IV	V	
Ferbam 2 lbs.	25.00	24.25	22.33	21.25	21.00	22.76*
Nabam 2 qts. + 1 lb. $ZnSO_4$	34.49	38.12	38.75	40.75	35.25	37.47*
Phygon XL 1 lb.	54.24	54.00	54.33	59.34	55.19	55.42*
341C 1 qt. + 1/2 lb. lime	52.83	55.05	55.44	60.89	47.75	54.39*
Untreated check	60.00	63.13	60.25	70.75	56.25	62.07

All spray mixtures contained Rohm and Haas Triton B1956 1/2 pt./100 gal.
* Least significant difference at the one percent level 4.32.

In both the 1949 and 1950 trials weekly application of ferbam at the rate of 2 pounds per 100 gallons of water gave excellent control of Botrytis leaf spot of gladiolus. Statistical analysis of the 1949 data showed that ferbam and nabam were significantly better than Phygon and Puratized Agricultural Spray and that application of the latter two materials resulted in significant reduction of disease as compared to the untreated checks. In 1950 the incidence of leaf spot in the ferbam sprayed plots was significantly less than in any of the other treatments. Nabam was superior to Phygon and Crag Fruit Fungicide 341C, and the latter two materials caused a significant reduction in leaf-spot incidence as compared to the untreated check.

In both years ferbam was far superior to the other materials tested in preventing development of leaf spot, although all of the materials gave a significant decrease in the level of disease as compared to the untreated check. Actually ferbam was relatively more effective in controlling disease than is indicated by the differences in disease indexes. This is because the method of data assessment tends to overemphasize the severity of disease. This fault could probably be

avoided by the use of additional disease classes. It is interesting to note that the relative effectiveness of the chemicals in preventing spore germination was comparable to their relative effectiveness in preventing gladiolus leaf-spot in the field.

Both ferbam and nabam gave economic control of Botrytis leaf-spot of gladiolus under Oregon conditions. Although ferbam was most effective in disease control, it has the undesirable quality of leaving a conspicuous black residue on foliage and flowers. For this reason ferbam has been recommended to those growers who grow for corm production only or where sale of cut flowers is not involved and nabam has been recommended for use when cut flowers are to be sold.

DEPARTMENT OF BOTANY AND PLANT PATHOLOGY, OREGON AGRICULTURAL EXPERIMENT STATION, CORVALLIS, OREGON

SIGNIFICANT SPECIMENS OF SPHACELOMA MURRAYAE, PATHOGEN OF WILLOW GRAY SCAB

Anna E. Jenkins and D. M. McLean

The hosts and range of Sphaceloma murrayae Jenkins & Grodsinsky (4), causing gray scab of willow (Salix), as known by 1946 (cf. 1, 2 and 3[1]) were as follows:

Host	Range (State or Country)
S. fragilis	Rhode Island, New York, Virginia, and New Zealand
S. fragilis x alba	Virginia
S. lasiandra	Oregon and Washington
S. lasiolepis	California
S. viminalis	Latvia and Argentina

Three specimens of the Sphaceloma have become available since 1946 as listed below:

On Salix lasiandra var. lancifolia (Ands.) Bebb, Lyman (between Sedro Woolley and Hamilton), Skagit Co., Washington, July 1947, D. M. McLean.

On Salix lasiandra Benth., west of Mount Vernon, Skagit Co., Washington, August 18, 1947, D. M. McLean.

On Salix fragilis L., Auckland, Mt. Albert, New Zealand, April 1949, Joan M. Dingley.

The original report of the Sphaceloma on willow in Washington (2) was based on the following specimen:

On Salix lasiandra, vic. Allen, 2 miles south of the Samish River, Skagit Co., August 31, 1943, E. I. Smith, M. J. Forsell, and C. G. Anderson.

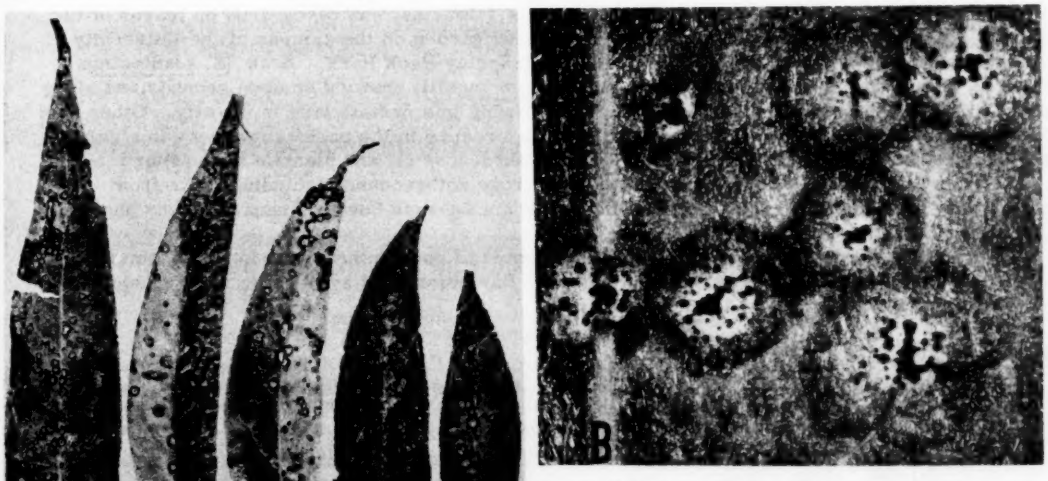

FIGURE 1. Sphaceloma murrayae on leaves of Salix lasiandra, west of Mt. Vernon, Skagit Co., Wash., A, x 3/4. B, group of abundantly fertile lesions, x 8. Photographs by R. L. Taylor.

[1] In (3, page 416, column 2, paragraph 2), line 5 should read "in Skagit County, Washington (1, 28, p. 274)."

By virtue of the two collections of 1947, a variety of Salix lasiandra is added to the host range of the fungus, as well as a specimen record of its existence on the species in another locality in Skagit County.[2] Willow in this section is commonly infected as revealed by observations during the past several years. The specimen from Mount Vernon, with its abundantly fertile lesions (Figure 1) has been reserved for distribution in the Jenkins-Bitancourt Myriangiales selecti exsiccati (No. 430).

Sphaceloma murrayae was discovered in the Nelson district of New Zealand (4). Dr. Dingley's specimen from Auckland serves to extend the known distribution of the pathogen in that country, as well as to provide the first available specimen from that source.

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DIVISION OF MYCOLOGY AND DISEASE SURVEY, AND DIVISION OF VEGETABLE CROPS AND DISEASES, BUREAU OF PLANT INDUSTRY, SOILS, AND AGRICULTURAL ENGINEERING, AND WASHINGTON STATE AGRICULTURAL EXPERIMENT STATION COOPERATING, MOUNT VERNON, WASHINGTON

SPOT ANTHRACNOSE OBSERVATIONS AT LONDON, ONTARIO, AUGUST 1951

Anna E Jenkins and John Dearness

Anthracnose of rose (Sphaceloma rosarum (Pass.) Jenkins) was discovered on leaves of two different rose plantings examined, the first in a mixed garden on the campus of the University of Western Ontario, the second ornamenting a drive in Spring Bank Park. Scab (S. plantaginis Jenkins & Bitanc.) was abundant on plantain (Plantago rugelii) growing on open grounds and along paths. This disease was present also on plantain growing in a private lane in the city. Other spot anthracnose suscepts examined, willow and Virginia creeper in the park, snowberry in a garden near the lane, were uninfected. Both snowberry anthracnose (1) and plantain scab (4) are reported from Quebec. Prior Canadian records of rose anthracnose, including those from Ontario, are contained in (3: 325) and in Canadian Plant Disease Survey Annual Reports beginning with that for 1942.

As elucidated elsewhere (2), the first actual report of rose anthracnose in North America is that by Bartholomew (1930), based on Dearness and Bartholomew's systematic study of specimens from Stockton, Kansas, August 1928.

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DIVISION OF MYCOLOGY AND DISEASE SURVEY, BUREAU OF PLANT INDUSTRY, SOILS, AND AGRICULTURAL ENGINEERING, BELTSVILLE, MARYLAND; AND LONDON, ONTARIO

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[2]We are indebted to Dr. C. R. Ball for identifying both the species and variety.

RECORD OF ELSINOË AUSTRALIS IN BOLIVIA

Martin Cárdenas and Anna E. Jenkins

Elsinoë australis Bitanc. & Jenkins (2) causing the disease termed "sweet orange fruit scab" is now well known to have been established for many years in four South American countries, viz., Brazil, Uruguay, Argentina, and Paraguay (1, 3, 4). It has seemed that sooner or later evidence would be forthcoming to show that E. australis exists also in Bolivia; moreover, that it is probably of long-standing in that country, where sweet oranges are of old stock and aged trees exist.

Following our correspondence on this subject initiated several years ago, the first writer inspected sweet oranges in fruit markets of Cochabamba for symptoms of sweet orange fruit scab. Samples sent the second writer were verified as of that disease. It was ascertained that the scab was one of the chief maladies of the marketed sweet oranges and that the fruit so affected came from the orange-growing districts of Santa Cruz. Observations during the past several years indicate that sweet orange fruit scab is widely distributed and severe in this Department. The disease was not detected on sweet oranges from the other orange-growing district supplying Cochabamba markets, namely, Yungas, Department of Le Paz. Santa Cruz, lying westward of Matto Grosso, Brazil, is a rather tropical, low dry region (400 m.). Yungas comprises eastern Andean slopes (1800 m.).

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NOTES ON SPOT ANTHRACNOSES AND RELATED SUBJECTS. III. THIRTY NEOTROPICAL ELSINOACEAE RECENTLY DESCRIBED[1]

A. A. Bitancourt and Anna E. Jenkins

Thirty new species of Elsinoaceae from the neotropics are described in the first two numbers of our series entitled "Studies in the Myriangiales" (1, 2). The distribution of one of these species, Sphaceloma asclepiadis on Asclepias curassavica also in the Old World tropics is indicated and its presence shown in the West Indies virtually a century and a quarter ago. This is the earliest available record of a member of the Elsinoaceae in the New World. It is natural to assume that all 30 fungi are more widely distributed than our initial records of them reveal. In one instance we were able to demonstrate that one of our new species (number 7 in the list below) is found in most of the New World countries in which its host is indigenous, as well as to furnish an early record of it, i.e. Brazil, 1855.

Among the various hosts represented by the 30 new species are plants of economic importance, also a few weeds. For convenience of reference, the several Myriangiales, together with their host species and host families, are here listed. The order follows that of their description.

[1]This series of notes, with its general title and numbered sub-titles, is a continuation of our brief articles dealing with the subject indicated.

Species of Elsinoë or Sphaceloma	Host	Host family
1. S. allamandae	Allamanda schotti	Apocynaceae
2. S. asclepiadis	Asclepias curassavica	Asclepiadaceae
3. S. cassiae	Cassia splendida C. sp.	Leguminosae
4. E. centrolobii	Centrolobium robustum	Leguminosae
5. S. cupaniae	Cupania oblongifolia C. vernalis C. sp.	Sapindaceae
6. S. gustaviae	Gustavia augusta	Lecitidiaceae
7. S. heliotropii	Heliotropium transalpinum	Borraginaceae
8. S. krugii	Euphorbia heterophylla E. prunifolia var. repanda	Euphorbiaceae
9. S. psidii	Psidium guajava	Myrtaceae
10. S. sapii	Sapium sp.	Euphorbiaceae
11. S. abutilonis	Abutilon striatum	Malvaceae
12. S. aegiphilae	Aegiphila sellowiana ?	Verbenaceae
13. S. amazonensis	Indet.	Bignoniaceae
15. S. bidentis	Bidens pilosa	Compositae
15. E. diospyri	Diospyros kaki	*Ebenaceae
16. S. ditremexae	Cassia hirsuta (Ditremexa hirsuta)	Leguminosae
17. S. erythrinae	Erythrina crista-galli E. reticulata	Leguminosae
18. S. fagarae	Fagara coco F. hiemalis F. riedeliana	Rutaceae
19. S. guatemalensis	Centropogon cordifolius	Campanulaceae
20. S. hoveniae	Hovenia dulcis	Rhamnaceae
21. E. jatrophae	Jatropha curcas	Euphorbiaceae
22. S. lobeliae	Lobelia hassleri	*Lobeliaceae
23. S. manihoticola	Manihot esculenta M. glaziovii	Euphorbiaceae
24. E. mulleri	Polyscias guilfoylei	Araliaceae

(Cont.)

Species of Elsinoë or Spahceloma	Host	Host family
25. S. phyllocalycis	Phyllocalyx laevigatus	Myrtaceae
26. S. sesseae	Sessea brasiliensis	*Solanaceae
27. S. siphocampyli	Siphocampylus macropodus	*Campanulaceae
28. S. uberabensis	Indet.	
29. E. valleae	Vallea stipularis	*Tiliaceae
30. S. viticis	Vitex polygama	Verbenaceae

*New host family for the Elsinoaceae

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NOTES ON SPOT ANTHRACNOSES AND RELATED SUBJECTS. IV. SPOT ANTHRACNOSE SUSCEPTS AMONG "MAJOR AGRICULTURAL CROPS"

Anna E. Jenkins and A. A. Bitancourt

In McCallan's (5) list of 50 "Major Agricultural Crops in the United States" are 11 crops that are subject to spot anthracnose attack. Preceded by the consecutive number in McCallan's list these are; 9--soybean; 10--oranges; 11--apples; 15--sweetpotatoes; 18--peanuts; 19--grapes; 28--pears; 31--lemons; 32--grapefruit; 33-- ...., plums, and 50--pecans. The diseases involved that are unknown in the United States are the recently discovered soybean scab (3), sweet orange fruit scab (Elsinoë australis Bitanc. & Jenkins), stem and foliage scab of sweetpotato (E. batatas Viegas & Jenkins), scab of peanut (S. arachidis Bitanc. & Jenkins), and plum spot anthracnose (Sphaceloma sp. (1)). Correspondingly, the first and last diseases just named have not been found in Brazil. Bolivia has just been added to the known distribution of sweet orange fruit scab (2). Likewise, southeastern and southwestern China and Truk Islands, in particular Fefan Island, are added to that of stem and foliage scab of sweetpotato (4).

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SOME NEW RECORDS OF PLANT DISEASE OCCURRENCE

APPLE ROOT ROT IN GEORGIA

By Julian H. Miller

An apple root rot apparently caused by Xylaria polymorpha was discovered by Mr. H. W. Rankin in a Rabun County orchard on August 8. The elevation of the orchard was 3200 feet. The single tree with the mature ascocarps at the base had only recently died. This is rather far south for this species and it is the first time the writer has it from Georgia on any host. All previous records have been of X. mali.

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PEACH ANTHRACNOSE FOUND IN WEST VIRGINIA

By Wilson L. Smith, Jr. and Mark H. Haller

Erly-Red-Fre variety of peaches obtained near Martinsburg, West Virginia, developed 1 to 2 percent of anthracnose (caused by the bitter rot fungus, Glomerella cingulata) lesions during storage tests at Beltsville, Maryland. The lesions were not visible when the fruit was placed in storage, but they were clearly defined at the end of 4 and 6 days at 75° F. In tests with other varieties obtained from the same orchard later in the season anthracnose was found, but only on an occasional peach.

A survey was made of the orchard from which the peaches were obtained, and no lesions were found on the fruit, on the trees, or on culls or ripe fruit in the packing house. The peach orchard was adjoining apple orchards, but no lesions were found on the apples.

It is believed that this is the first report of this disease on West Virginia peaches. Anthracnose on peach has been reported by other workers from Arkansas, Florida, Georgia, Maryland, Michigan, New Jersey, Ohio, Tennessee, and Texas.

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PLANT DISEASES NEW TO PERU

By C. Bazán de Segura

During 1950 the following plant diseases not previously known to occur in Peru were named from material studied at "El Centro Nacional de Investigacion y Experimentacion Agricola La Molina".

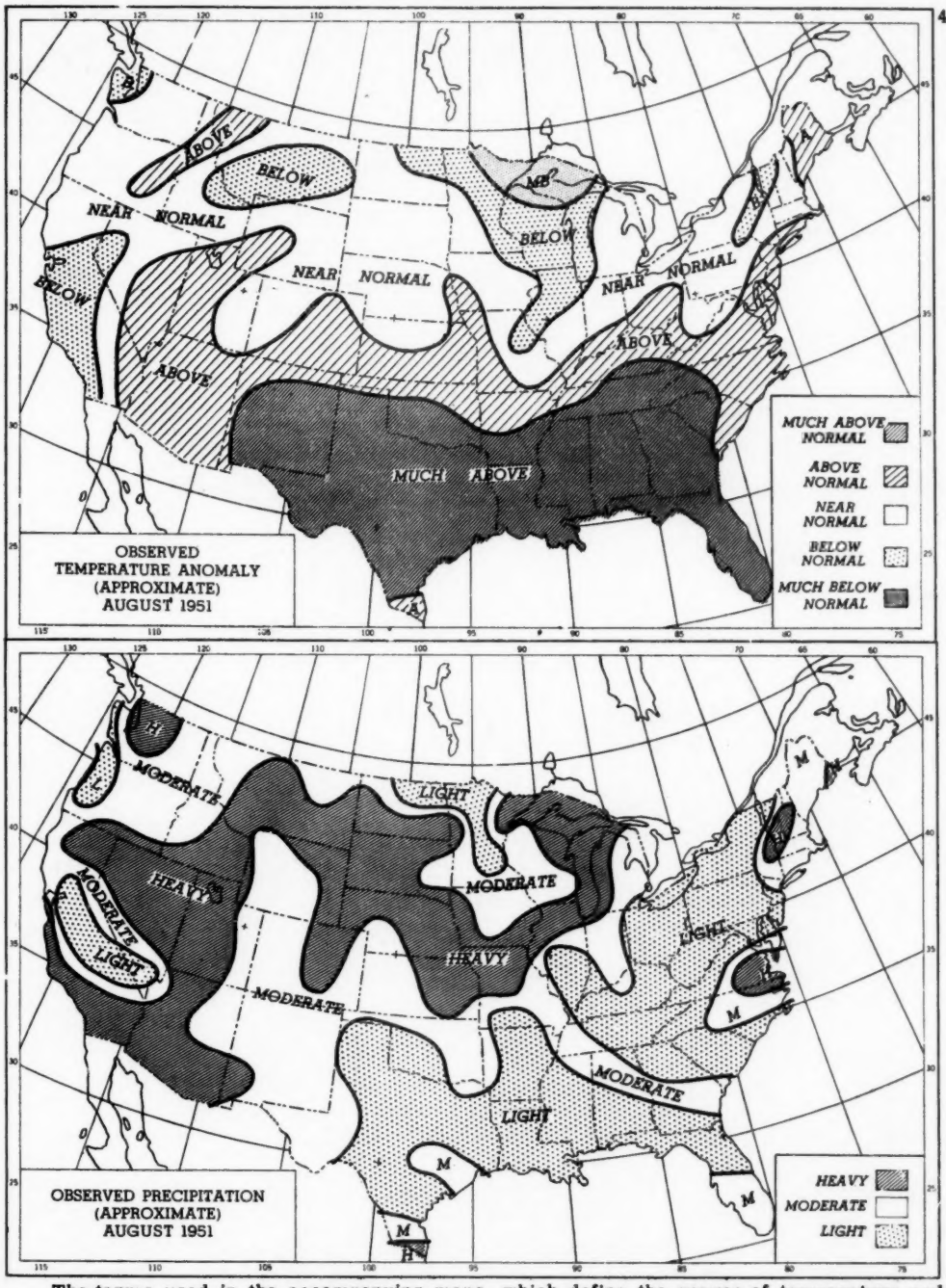
ALLIUM CEPA, ONION:
Peronospora destructor; producing downy mildew on leaves. -- Arequipa.
ARAUCARIA EXCELSA:
Phytophthora parasitica Dastur[1]; attacking stems of seedlings. -- Lima.
BRASSICA CAMPESTRIS:
Sclerotinia sclerotiorum; on stems and leaves. -- Lima.
CARICA PAPAYA, PAPAW:
Gloeosporium sp.; on fruits. -- Chanchamayo.
Pucciniopsis caricae; on leaves, -- La Molina, Chanchamayo.
CHENOPODIUM SP.:
Sclerotinia sclerotiorum; on stems and leaves. -- Lima.
CITRUS SINENSIS, ORANGE:
Colletotrichum gloeosporioides; on stems and fruits. -- Huancayo.
Nematospora sp.; on fruits. -- Chanchamayo.
Septoria sp.; on leaves. -- Chanchamayo.
MUSA PARADISIACA, BANANA:
Cordana musae; on leaves. -- Chanchamayo.
Verticillium sp.; producing wilt on plants. -- Cañete.

[1]Determined by Miss Muriel O'Brien, Division of Mycology and Disease Survey, Plant Industry Station, U. S. Department of Agriculture.

NICANDRA PHYSALOIDES, APPLE OF PERU:
Sclerotinia sclerotiorum, on stems and leaves. -- Lima.
OXALIS TUBEROSA:
Urocystis oxalidis Pazschke[2]; on tubers. -- Huarochiri.
PHASEOLUS VULGARIS, BEAN:
Ascochyta phaseolorum; on leaves. -- Lima y Chincha.
Botrytis cinerea; on leaves, stems and fruits. -- Lima.
PISUM SATIVUM, PEA:
Colletotrichum pisi; on fruits. -- Market of Lima
Sclerotinia sclerotiorum; on fruits. -- Market of Lima
PRUNUS PERSICA, PEACH:
Cladosporium carpophilum; on leaves. -- La Molina.
Coryneum beijerinckii; on fruits. -- La Mejorada.
Septobasidium pseudopedicellatum; on stems. -- Cuzco.
PYRUS MALUS, APPLE:
Septobasidium pseudopedicellatum; on stems. -- Cuzco.
PYRUS COMMUNIS, PEAR:
Septobasidium pseudopedicellatum; on stems. -- Cuzco.
ROSA SP., ROSE:
Diplocarpon rosae; on leaves. -- Huancayo
SOLANUM ANDIGENUM, POTATO:
Botrytis cinerea; on leaves and stems. -- Lima
Colletotrichum atramentarium; on tubers. -- Huancayo.
Sclerotinia sclerotiorum; on stems and leaves. --Lima.

CENTRO NACIONAL DE INVESTIGACION Y EXPERIMENTACION AGRICOLA DE LA MOLINA

[2]Determined by Dr. Lee Ling, Food and Agriculture Organization of the United Nations.



The terms used in the accompanying maps, which define the ranges of temperature and precipitation, are numerical class limits. These are based on a statistical analysis of past records through which is determined the normal frequency of occurrence of temperatures and precipitation at various times of the year for different locations. For temperature the classes above, below, and near normal are so defined that they each normally occur one-fourth of the time; much above and much below normal, one-eighth of the time. Precipitation is depicted in terms of light, moderate, and heavy, each class normally occurring one-third of the time and thereby having equal probability of occurrence. These maps graphically represent only the general trends and give the country's weather picture at a glance. For quantitative studies, where monthly mean temperatures and actual precipitation records are needed for a given time and place, other publications of the Weather Bureau should be consulted. P. R. M.